AVIATION WEEK
A McGRAW-HILL PUBLICATION
SEPT. 29, 1952

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ENGINEERING EXCELLENCE

AIRCRAFT SPARK PLUGS

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GAS TURBINE IGNITER

B G products are the choice wherever quality is specified. Engineered for maximum performance and durability, B G Spark Plugs, Igniters, Thermocouples and Thermocouple Harnesses meet the specific requirements of engine manufacturers and the armed services. In Aviation there is NO substitute for B G quality.

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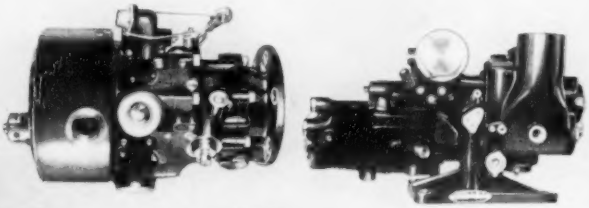
GAS TURBINE AFTERBURNER IGNITER

The new Lockheed F-94C STARFIRE is designed to intercept invading bombers at altitudes up to 45,000 feet. The STARFIRE'S high speed and extreme maneuverability demand split-second compensation for continual changes in pressure, altitude, and temperature. A fuel metering control built to the utmost precision is required.

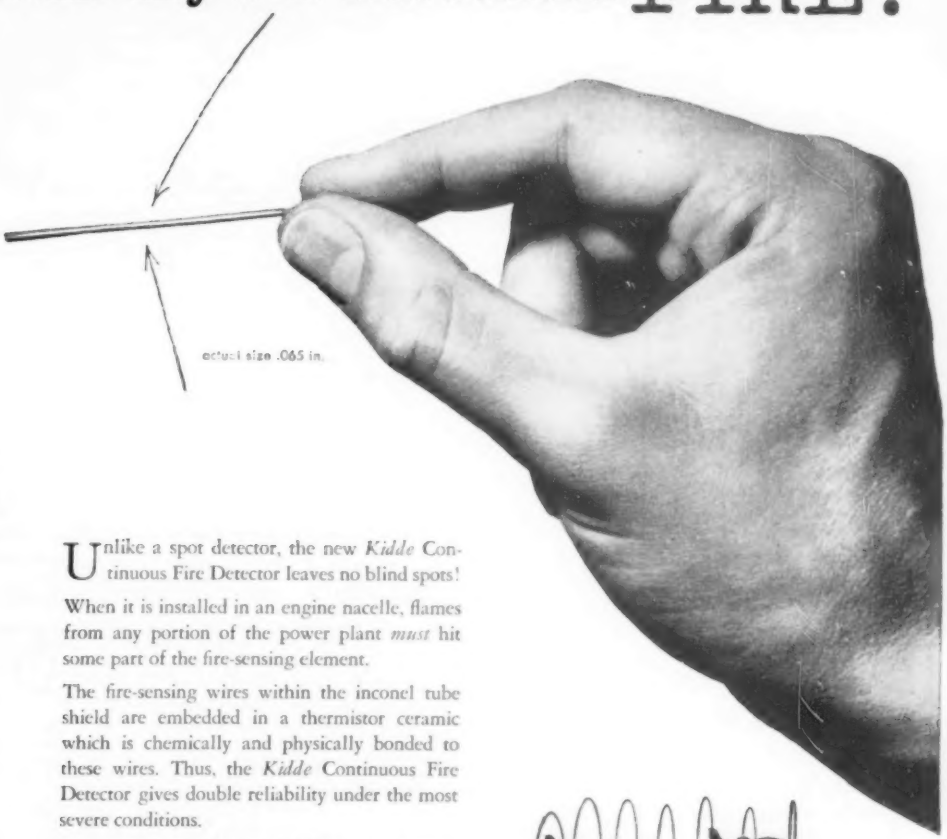
Metering controls designed by Holley are used on both the afterburner and the Pratt and Whitney J-48 jet engine.



HOLLEY
Carburetor Co.
DETROIT 4, MICHIGAN

LEADER IN THE DESIGN, DEVELOPMENT, AND MANUFACTURE OF AVIATION FUEL METERING DEVICES

...the tiny wire that screams FIRE!

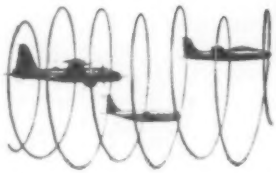


Unlike a spot detector, the new *Kidde* Continuous Fire Detector leaves no blind spots!

When it is installed in an engine nacelle, flames from any portion of the power plant *must* hit some part of the fire-sensing element.

The fire-sensing wires within the inconel tube shield are embedded in a thermistor ceramic which is chemically and physically bonded to these wires. Thus, the *Kidde* Continuous Fire Detector gives double reliability under the most severe conditions.

The result is that in over 2,000 hours of actual flight tests there is not one report of a false alarm, although several fires were detected.



the new *KIDDE* continuous fire detector permits

NO BLIND SPOTS...

NO FALSE ALARMS

Kidde

Walter Kidde & Company, Inc.
919 Main St., Belleville 9, N. J.

The word "Kidde" and the Kidde seal are trade-marks of Walter Kidde & Company, Inc. and its associated companies.

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for aircraft

for 7 mm cable

1041-C Steatite
1041-M Mycalex
1041-D Alumina
(AN 4164-2)

for 7 mm cable

1099-C Steatite
1099-M Mycalex
1099-F Phenolic
1099-D Alumina
(AN 4164-1)

9/16" and 1" sleeves only, without springs, are also available

TERMINAL COLLARS

1042 Neoprene
1043 Silicone

Used with all ⅝" connectors on 7 mm cable

for military trucks and tanks

for 5 mm cable

SP420 Steatite
CC4025 Mycalex
CC4006 Alumina

for 5 mm cable

CC4017 Steatite
CC4020 Mycalex
CC4013 Alumina

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Neoprene or Silicone Grommets

AD51-960
Used with all 11/16" connectors on 5 mm cable

AD50-894
Used with all 9/16" connectors on 5 mm cable

AA50-313
Spring Assembly

Used with all 9/16" and 11/16" connectors for 5 mm cable

AUBURN SPARK PLUG Co, Inc., Auburn, N.Y.

Aviation Week

ABP Member ABC

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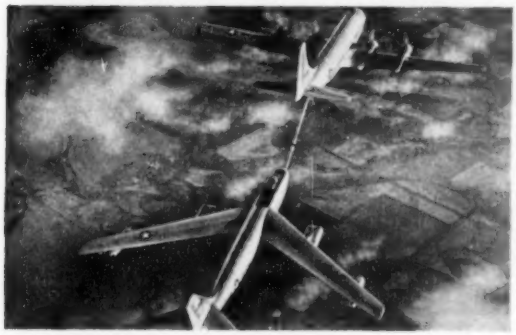
☆ Remarkable in 1929

The refueling-in-flight of the "Question Mark", which set an endurance record in 1929, was one of the first ventures of its kind. Gasoline and oil were taken aboard from a "tanker" airplane by lowering a hose. Though they encountered difficulties they stayed aloft for 150 hours and 40 minutes for a new world's record. *Remarkable indeed—in 1929!*

Routine in 1952



Today "air tankers" transfer large quantities of fuel with speed and efficiency. Here a Boeing KC-97 tanker pumps fuel into a Boeing B-47 bomber by means of the new "Flying Boom" device. This, and newest advancements in pumps, switches and solenoids make these modern refueling airships veritable *service stations in the sky!*

Since the days of the "Question Mark" refueling procedures have improved and so have the fuels! And through the years Phillips Petroleum Company has been a pioneer in the development of high octane gasolines and special lubricants for *all* ranges of flight.

In addition to their capacity for producing tremendous quantities of 115/145 grade aviation gasoline, Phillips today, is meeting the latest specifications for the newest jet and turbo-prop engines. Like any engine, airplane engines are only as good as the fuel that powers them!

Depend on Phillips for your needs in aviation fuels and lubricants!

AVIATION DIVISION
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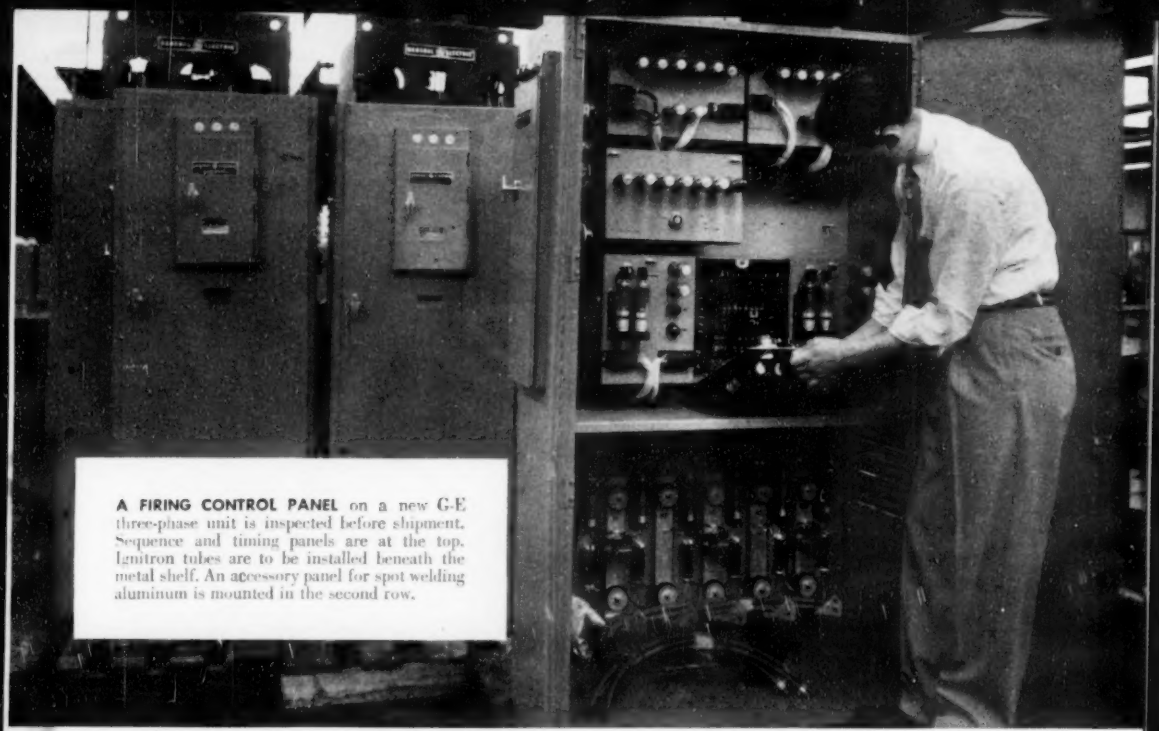
BARTLESVILLE, OKLAHOMA

Phillips 66

AVIATION PRODUCTS



A FIRING CONTROL PANEL on a new G-E three-phase unit is inspected before shipment. Sequence and timing panels are at the top. Ignitron tubes are to be installed beneath the metal shelf. An accessory panel for spot welding aluminum is mounted in the second row.

New Maintenance and Modification Features on G-E Three-phase Resistance Welding Control

The picture above shows the new G-E three-phase sectionalized control with hinged panels for each control process, permitting quick inspection and servicing. To you, this new G-E control means:

DEPENDABLE OPERATION

The new G-E three-phase resistance welding control provides lower maintenance because just one relay on the main panel operates each time the solenoid valve relay operates. All resistors, transformers, capacitors, and other components are conservatively rated for long life.

VERSATILE DESIGN

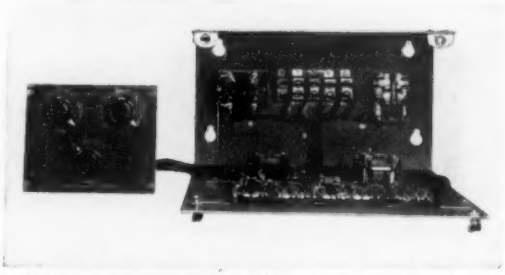
Circuit points are easy to reach. There is room in the cabinet for accessories or modifications when job requirements change. For example, if you are changing from welding $\frac{1}{2}$-inch to $\frac{1}{4}$-inch or thicker metal, you can get the added power simply by changing Size C ignitron tubes to Size D. A special kit is available containing the larger bus bars that can be quickly installed by your own service crew.

SERVICE FACILITIES NEAR YOU

Factory-trained G-E service engineers are on call 24 hours a day. There is one in your area ready to help you keep production going.

For more information on G-E three-phase welding control, fill out and send in the attached coupon today. General Electric Company, Schenectady, New York.

GENERAL ELECTRIC



A SEAM-WELDING AUXILIARY PANEL, like other panels, is easily mounted in the cabinet because of keyhole mounting slots. Spade terminals are easily connected to the terminal boards on the main panel. Dials are mounted on front of cabinet.

General Electric Company
Section E 645-56
Schenectady, New York
Gentlemen:

Please send me bulletin GEC-491 on G-E three-phase welding control. I would like to have this for:

☐ reference material ☐ an immediate project

NAME .....

COMPANY .....

ADDRESS .....

NEWS DIGEST

Domestic

Babb Co., new and used aircraft, parts and equipment firm, has entered into arrangements to sell all its stock to Atlas Corp. or an associated company. Floyd Odlum, president of Atlas, said that Charles Babb will continue as head of the business and Edward H. Lund will stay on as manager of its eastern branches.

U. S. air services have received more than 10,000 military planes since the outbreak of Korean hostilities, according to Aircraft Industries Assn. AIA also says the aircraft industry will reach its peak in December, 1952, with deliveries between 1,000 and 1,100 planes monthly, although airframe weight output will continue to rise.

Don Flower, general sales manager for Cessna Aircraft Corp., Wichita, Kans., for 12 years, has resigned "for personal reasons." Sources close to Flower say he will have a vacation, then possibly take on a Cessna dealership or distributorship. Ralph Floyd, assistant sales manager, also has resigned to take over a Cessna distributorship.

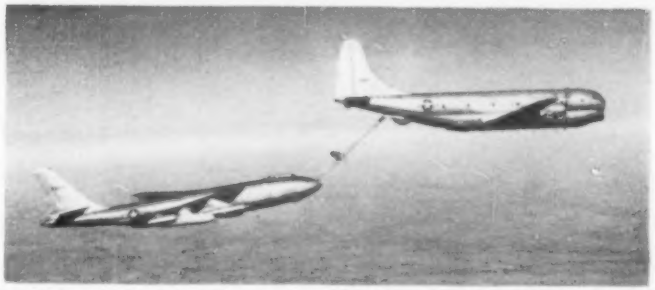
New nonstop copter mark of 12 hr. 57 min. has been set by Elton J. Smith, who flew a Bell 47D-1 from Ft. Worth, Tex., to Niagara Falls, N. Y., Sept. 17. Distance is 1,234 mi. Previous record, 803.6 mi. was set in 1946.

Col. James M. McDonnell, USAF (Ret.), chief civilian assistant to the commanding general of the Eastern Air Procurement District, died Sept. 16 in N. Y. An aviation engineer, McDonnell was associated with the Air Force for 40 years. He was 64.

U. S. civil plane exports of aircraft of 6,000 lb. or less totaled 28 valued at $310,120 during August, bringing to 230 the number of planes exported in the first eight months of 1952.

Brig. Gen. John W. Sessums, Jr., deputy for development of the Air Research & Development Command Hq. in Baltimore, Md., has been named commanding general of the 13th Air Force with headquarters in Manila. He relieves Maj. Gen. Ernest Moore, who has been appointed deputy chief of staff for the Air Force, Far Eastern Command.

Trans World Airlines' flight engineers have set strike date Sept. 29, when they will walk off the carrier's domestic and international services. The engineers have been negotiating since their contract expired in May. Original strike date was July 10, but was postponed with formation of a Presidential emergency board. Issue is said to be wages. The board recommended a 10% increase, which has been turned down by the flight engineers.



BOEING B-47B TAKES ON FUEL while in flight with a Boeing KC-97 tanker acting as the airborne filling station. This is the first photo to show the 600-mph.-plus B-47B Stratojet being refueled aloft. Technique makes possible a considerable increase in the B-47's striking mobility. Stratofreighter uses the Boeing-developed Flying Boom.

Miami International Airport's 68-ft., 110-ton traffic control tower has been moved more than a mile because of its proximity to one of the airport's 9,000-ft. runways.

Albert E. McPherson, 44, senior engineer, aircraft structures group, National Bureau of Standards, died at his home near Washington, D. C. He was secretary of the Society for Experimental Stress Analysis.

Buick Motors has delivered its first J65 Sapphire turbojet engine to the Air Force. The firm is building the engines under license from Wright Aeronautical division.

Airborne radar subcommittee of Aeronautical Radio, Inc. (ARINC) will meet with avionics equipment makers Oct. 7-8 on third draft of a proposed specification which covers airline transport radar.

Ramjet-powered copter transport, seating 40-50 passengers, is depicted in artist's sketch carried in recent Hiller Helicopters, Inc., house organ. Craft has a single two-blade rotor with large ramjet engines at tips. Landing gear is retractable.

Financial

Northrop Aircraft, Inc., Hawthorne, Calif., has voted an extra 10% dividend in stock, payable Oct. 21 to holders of record on Oct. 7.

Lockheed Aircraft Corp., Burbank, Calif., reports sales of $188,629,000 during the first half of 1952, a 92% increase over the same period last year. After provision for federal taxes, earnings were $2,610,000. Backlog has increased 22% to $1,519,968,000.

Northwest Airlines has declared regular quarterly dividend of 28¾ cents per share on its 4.6% cumulative preferred stock, payable Nov. 1 to holders of record Oct. 20.

International

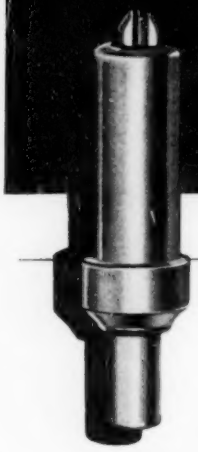
Aerovias Guest, Mexican airline, reportedly plans to buy an undisclosed number of Bristol Britannia turboprop airliners for operation from Mexico City to New York.

DH Venom all-weather jet fighters have been ordered by Sweden. They will be fitted with Swedish-built de Havilland Ghost engines.

Air Antilles, with backing from Air France, has recently opened a new air service between Martinique and Guadeloupe, French West Indies. Three flights a week are being made.

Sir Miles Thomas, chairman of British Overseas Airways Corp., is quoted as saying that his airline would permit Pan American World Airways to buy DH Comets allocated to BOAC to help export sales.

Quantas Empire Airways have grounded all DH Drover trimotor transports following a series of yet undetermined accidents.



FAST, SAFE AND SURE!

3H safety clamps are easy to apply

For faster, better, more efficient fabrication of sheet metal riveted and welded sections, as well as other applications, 3H Safety Clamps and applying tools are the overwhelming favorite with major aircraft plants. They are easy to apply and remove, hold securely under all conditions, withstand hard usage and offer a maximum of safety.

Since the start of World War II literally millions of 3H Safety Clamps have been used in aircraft production. They have been constantly improved and new types developed for specific purposes. The present 3H line is comprised of several basic types (shown below) with sizes to fit various size drill holes and thicknesses of material. Or, Monogram engineers will develop special clamps for your unusual requirements. Write today for catalog.

AVIATION CALENDAR

Sept. 29-Oct. 1—National Electronics Conference, Sherman Hotel, Chicago.

Sept. 30-Oct. 2—Aircraft Spark Plug and Ignition Conference, sponsored by Champion Spark Plug Co., Toledo.

Oct. 1-4—Society of Automotive Engineers national aeronautics meeting, aircraft engineering display and aircraft production forum, Hotel Statler, Los Angeles.

Oct. 2-3—Corporation Aircraft Owners Assn. fifth annual meeting and forum, Blackstone Hotel, Chicago.

Oct. 7-8—Aircraft Electrical Society ninth annual display meeting, Pan Pacific Auditorium, Los Angeles.

Oct. 9-10—Airport management operations conference, Oklahoma University.

Oct. 11-18—Fourth annual All-Texas Air Tour; information available from Texas Aeronautics Commission, Austin.

Oct. 19-24—American Welding Society national fall meeting, Bellevue-Stratford Hotel, Philadelphia.

Oct. 25-Nov. 2—International aviation and travel exposition, Navy Pier, Chicago.

Oct. 26—Los Angeles International Airport Air Fair and Open House, Los Angeles.

Oct. 28-30—Transport Aircraft Hydraulics System Conference, sponsored by Vickers, Inc., Hotel Park Sheraton, Detroit.

Oct. 28-30—AIEE Air Transport Committee annual meeting, Commodore Perry Hotel, Toledo.

Oct. 29-31—AIEE conference on machine tools, Ten Eyck Hotel, Albany, N. Y.

Nov. 6-7—National fuels and lubricants meeting, Society of Automotive Engineers, The Mayo, Tulsa, Okla.

Nov. 7—IRE symposium on microwave circuitry, Western Union Auditorium, New York.

Nov. 8—Annual Midwestern Tool Engineering conference, University of Illinois, Urbana, Ill.

Nov. 11-12—Piper distributors' annual meeting, Lock Haven, Pa.

Nov. 13-15—Acoustical Society of America Symposium on aircraft noise, San Diego, Calif. (For details, write ASA, 57 E. 55 St., New York 22.)

Nov. 17-20—National Aviation Trades Assn. annual convention, Hollywood-Roosevelt Hotel, Los Angeles.

Dec. 2—Symposium on light-metal heavy forgings and extrusions for aircraft, SAE, ASME, IAS and AIME.

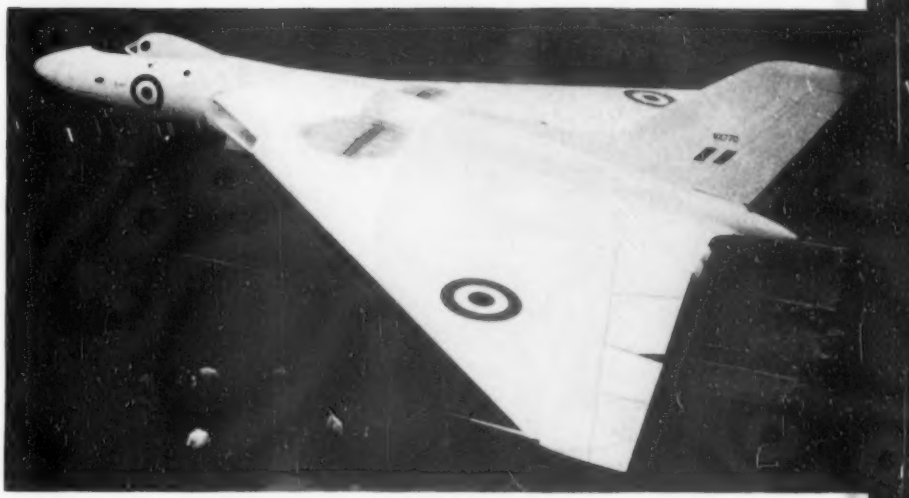
Dec. 2-5—Aviation Distributors and Manufacturers Assn. tenth annual meeting, The Kenilworth, Miami Beach.

Dec. 10-12—Joint AIEE-IRE-ACM conference on electronic computers, Park Sheraton Hotel, New York.

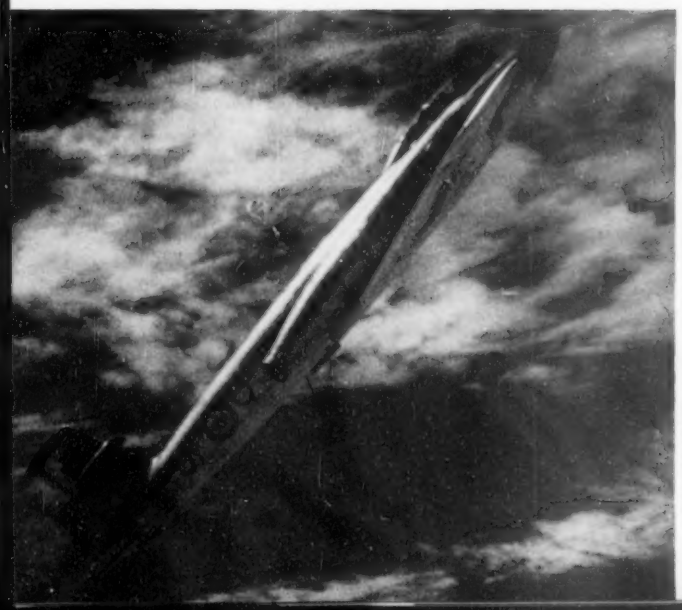
PICTURE CREDITS

7 — Boeing; 9 — (top) Butler-Green; (center) Hawker Siddeley; (bottom) Avro Canada; Canada; 14—Wide World; 17-18—Wide World; 21—(top) Charles E. Brown; 44—McGraw-Hill World News; 64—Douglas Aircraft Co.; 87—(right) Port of N. Y. Authority; 88—(top) USAF; (center) PNYA; 90—Convair.

PRINCESS ALOFT – Left photo shows huge ten-turboprop-engine Saro Princess flying boat making its public debut at recent SBAC show, Farnborough, England. Spanning 219 ft., the Princess can seat up to 105 passengers. Two other Princesses are being built, but reports are that they will be used as spares to keep the first flying.



DELTA BOMBER EMERGES–New Avro 698 delta bomber (right) seen close up as it was rolled out of the factory prior to showing at Farnborough. The dark areas on the wing near the fuselage pinpoint location of the craft's air brakes. Design philosophy behind the 698 was covered in Aviation Week Sept. 22, p. 22.

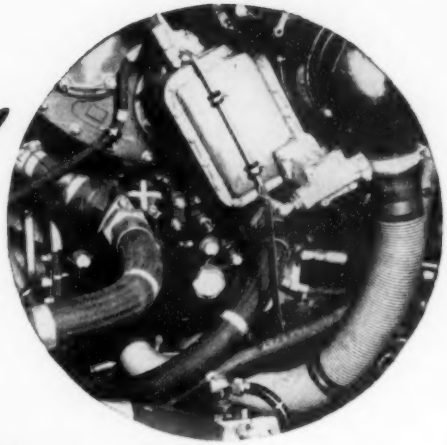


Foreign Planes Show Their Stuff

CF-100 HEADS SKYWARD–Two-seat all-weather Avro Canada CF-100 climbs at a steep angle. The speedy, radar-packed fighter is powered by two Avro Canada Orenda jets. The company is opening a new jet engine plant at Malton, Ontario, Sept. 29.

"Thread"

YOUR WAY OUT OF MISALIGNMENT TROUBLES



The illustrations above show just a few of the scores of applications for REX-FLEX. We will be pleased to send you more complete information on all types of services.

with REX-FLEX
Flexible Metal Hose
Ducting
Flexible Connections

WITH space for aircraft "plumbing" becoming more and more limited in each succeeding model, the "threadability" of REX-FLEX is more important than ever before. This ability of REX-FLEX to be threaded through the tight spots is the result of the extreme flexibility that is engineered into all REX-FLEX flexible metal assemblies. Fabricated by advanced methods from stainless steel, REX-FLEX achieves its flexibility without sacrificing the strength and fatigue-resistant characteristics necessary in aircraft.

REX-FLEX assemblies are made to your requirements for a wide variety of services ranging from anti-icing ducting to cross ignition tubes . . . from fire-proof fuel and oil lines to tail cone bellows assemblies.

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Flexon identifies products of Flexonics Corporation that have served industry for over 50 years.

Manufacturers of Convoluted and Corrugated Flexible Metal Hose in a Variety of Metals • Expansion Joints for Piping Systems • Stainless Steel and Brass Bellows • Flexible Metal Conduit and Armor • Assemblies of These Components

In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

WHO'S WHERE

In the Front Office

F. A. Boettger has been elected vice president-finance and treasurer of Cessna Aircraft Co., and **R. G. Largent** secretary.

Charles Schwartz is new assistant vice president-manufacturing for Stronghold Screw Products, Inc.

Ralph A. Anderson, formerly chief electrical engineer for Panellit, Inc., has been appointed vice president and chief engineer of Panascan, Inc., Chicago.

F. W. Gottschling, Jr., formerly with Marmon Products and Parker Aircraft Co., is the new administrative engineer and assistant to president of Greer Hydraulics, Inc.

Nelson B. David, formerly European regional director for Pan American World Airways, has been elected president and general manager of Alaska Airlines, succeeding **Stanley McCutcheon**.

Hamlin B. Johnston has been appointed general manager of Air Coach Transport Assn., succeeding **Forbes Huffman**, resigned.

Changes

A. S. Pugh, formerly in the purchasing department of Boeing Airplane Co., is new East Coast sales engineer for Hartwell Aviation Supply Corp., Los Angeles.

Donald P. Frankel has been appointed special assistant to the director of engineering and manufacturing, Marquardt Aircraft Co., Van Nuys, Calif.

Alfred R. Bridgford, Jr., formerly with Hiller Helicopters, has joined the helicopter development section of Jacobs Aircraft Engine Co., Pottstown, Pa.

Wally Schanz, who has been director of aviation for the Florida State Improvement Commission, has been named regional sales manager for Southern Aero Sales Co., Atlanta.

Val L. Follo has been named factory manager of Goodyear Aircraft Corp. **C. H. Zimmerman** will direct the company's wheel and brake, rocket and Wingfoot Lake divisions.

Turpin Gerard, Jr., formerly with Spartan Air Service, Ottawa, Canada, and Helicopter Aircraft Service, Weedsport, N. Y., has joined Doman Helicopters, Inc., Danbury, Conn., as test pilot.

Lewis E. Knerr, Jr., has been named airline maintenance superintendent for Pan American World Airways' Latin American division, succeeding **Henry F. Williams**.

Donald H. Jensen has been named public relations manager of engine division of Fairchild Engine & Airplane Corp., Farmingdale, N. Y.

George J. Fischer has been appointed general sales manager of Aeroquip Corp., Jackson, Mich.

Honors

William P. Lear, chairman of the board of Lear, Inc., has been elected to the board of trustees of Lovelace Foundation for Medical Education and Research, Albuquerque, N. M.

INDUSTRY OBSERVER

► KLM is interested in buying some Sikorsky S-55 ten-passenger helicopters for passenger operations in Holland. Idea of passenger helicopter service is taking hold rapidly in Europe where distances between many major population centers are relatively short.

► **Armstrong Siddeley is reversing the usual process of jet engine builders who strive to design longer life into their products. Their Viper, a 1,575-lb.-thrust turbojet designed for guided missiles and pilotless target aircraft, was supposed to have a maximum life of 10 hr. Present Vipers are exceeding the minimum thrust requirements and have a service life of 100 hr., thus keeping Chief Engineer Michael Lindsey and his staff busy redesigning the excess life out of the Viper.**

► Although there is no more airline interest in the de Havilland Sprite rocket, the Comet prototype is being used as a flying testbed for Sprite operations to develop future military applications.

► **Virtually every British engine firm and several not normally concerned with powerplants are working on rocket engines for guided missiles and supersonic fighters.**

► Lancashire Aircraft Corp., a British nonscheduled airline specializing in contracts for British troop movements, has fitted its York transports with rearward-facing seats as a safety measure. Pressure of British public opinion is mounting strongly in favor of rearward seating on regular airlines.

► **Only component now left of the original production version of the Gloster Meteor is the nosewheel support structure. Gloster is now building Meteors Mark 8 (ground attack), Mark 9 (low-altitude photo-recon), and Mark 10 (high-altitude proto-recon). Gloster has finished production of 700 two-seater Meteor jet trainers.**

► North American F-86H, ground support fighter scheduled for production at Columbus, Ohio, plant, will be fitted with General Electric's J73. This jet, originally tagged the J47-GE-21, was unveiled little over a year ago and was estimated as being in the 8,500-9,000-lb.-thrust class (AVIATION WEEK June 18, 1951, p. 17). Its choice for the heavier H-version of the Sabre bears out this estimate of engine power, probably greater now.

► **Air Force's desire for turboprop engine in the 12,000-15,000-hp. category points to Wright Aeronautical's new powerplant now in development stage. This turboprop, designed for AF, probably will meet the lower requirement of the horsepower bracket—12,000 hp. for takeoff. At this figure, it will have more than double the power of other announced U. S. turboprops. Meanwhile, nothing has been said of Wright's J67, still undergoing intensive development. If and when this emerges as a production engine, it should be a powerplant fundamentally refined from its Olympus characteristics, and with more power.**

► Informed British critics of their own aircraft industry point out three basic weaknesses: Failure of the British to develop their own aircraft armament, thus forcing continued dependence on foreign sources of supply; lack of research, development and production on modern airborne avionic equipment required for high-speed and all-weather operations; lag in development of power controls for high-speed aircraft.

► **Gross weight of the Canberras now being delivered to the RAF has risen to 45,000 lb. while estimates for the Martin-built version are approaching 55,000 lb.**

► Chance Vought Cutlass and the Douglas Skyray appear to be exciting the most interest among British test pilots specializing in high-speed work. They regard these two Navy fighters as the most interesting of the current crop of American fighter prototypes that have reached the flight test stage.

Washington Roundup

Post-Mobilization Planning

Washington is switching focus from defense buildup to the anticipated letdown. The tapering-off in military business should start in mid-1953. For the aircraft manufacturing industry generally it isn't expected to be felt to any substantial degree until mid-1955.

• **New vice chairman** of the President's Council of Economic Advisers, Robert Turner, has been assigned the task of drawing up a blueprint for orderly transition of defense industries to commercial production.

• **Secretary of Commerce** Charles Sawyer is in the picture, too. A 19-member advisory committee of outstanding industrialists recently appointed by the Secretary, working in collaboration with the Committee for Economic Development, is due to make a report Jan. 1. Its objective will be to furnish defense manufacturers comprehensive information on existing or potential markets for commercial items.

• **Munitions Board** is drawing up plans for industrial defense capacity that won't be needed in production in the level-off period.

The original plan—to keep three times the industrial capacity required for current production in the level-off period in operation on a one-shift (or less) basis so that output could be tripled at the push of a button—is out. It would be too expensive.

Munitions Board is drawing its plans on these two assumptions:

• Only a fraction of the capacity that will become surplus in the level-off period will be kept in "pilot line" status—so that it could be promptly accelerated to mass output.

• In the major portion of facilities, government-furnished equipment will be moved to one side in rented space and most of the floor space of the plant released for commercial production.

The board points out that having production machinery in the actual plant where it would be needed in event of an emergency would be an overwhelming advantage to having it located in government warehouses at points around the country. The advantage, the board feels, outweighs the additional expense.

New Production Boss

Munitions Board, which since its inception under the 1947 Unification Act has been politely treated as superfluous by the military services, is taking over its new role as top boss of the military production program with determination.

• Up to now the services have decided what should be done, done it, and generally long after the fact notified Munitions of the action. The board could, of course, appeal to the Secretary of Defense. But usually by the time the chairman of the board found out what was happening, it already had occurred.

• But from now on, the Munitions Board chairman—or the vice chairman—will make the decisions. The services will have the right, after the fact, to appeal to the Secretary.

Munitions Board is now preparing an avalanche of specific implementing orders. For example, an order requiring the services to get explicit approval of the board on any expansion of aircraft or other production expansion is on its way.

Lovett's apprehension that the board may move in too fast is shown in the restraint spelled out in his directive: "Implementing directives will be issued only so fast, and will cover only so much ground, as will permit of adequate preparation for and orderly execution of the implementation prescribed. . . ."

The new top-side authority over military production (Munitions Board) adds up to two men:

John D. Small

John Houston

• **John D. Small, chairman.** Annapolis-graduate Small served as director of the old Army-Navy Munitions Board and as executive officer of the War Production Board during World War II. Later he became administrator of the Civilian Production Administration, which superceded the WPB, and then, vice president of Emerson Radio and Phonograph Corp.

• **John Houston, vice chairman.** Formerly deputy administrator of Civilian Production Administration, he has had industrial experience as an officer of R. P. Adams Co. and Stacom Manufacturing Co. Before coming to Munitions a year ago, he served as assistant to presidential assistant, Dr. John Steelman.

Other members of the Munitions Board are representatives of the services. It is Small—or, in his absence, Houston—who now can make decisions for the board.

Small and Houston plan to work closely with former General Motors vice president, Hugh Dean, now "trouble-shooter" assistant to Lovett.

The 1947 Unification Act gave Munitions Board sweeping authority over military production. These are the provisions of Lovett's "charter" that, for the first time, pump life into the board:

• **Power of decision.** Munitions Board chairman, or vice chairman, now can unilaterally make a binding decision on any aspect of the military production program, subject only to veto by Lovett.

• **Follow-through.** Munitions Board has complete authority to "monitor" its decisions until they are implemented by the military services.

• **Loyal personnel.** Subject only to approval by Lovett, chairman of the Munitions Board can take military personnel from any of the services he chooses. During duty with the board, the military personnel will have no responsibility to the senior personnel of their services and their efficiency ratings, for promotion purposes, will be by the board chairman. This rules out the big drawback to an effective Munitions Board operation in the past: Military personnel have been selected for assignment to Munitions by their own service and remained protagonists for their service.

—Katherine Johnsen

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Plan to Reshuffle Air Production Fizzles

- **APB backs away from proposals of its acting chairman; reaffirms faith in Munitions Board schedules.**
- **Dr. T. P. Wright makes new recommendations to board, warns against overzeal in reducing plane types.**

By Aviation Week's Washington Staff

You didn't hear that loud, delayed-action explosion in the U. S. military aircraft procurement program in Washington last week.

Actually the explosion was a fizzle.

A meeting of the Aircraft Production Board Sept. 19 quietly backed away from the revolutionary recommendations made by acting chairman W. L. Campbell last July 9 to reshuffle virtually the entire aircraft program, canceling many large contracts and rushing new planes still on paper into large-scale production.

Instead, APB jointly reaffirmed its faith in Munitions Board Aircraft and Engine Schedules 18 and specifically decided against one Campbell recommendation for concentration on fewer types of engines.

Behind this action was the viewpoint of an "old pro" in the aircraft production planning field: Dr. T. P. Wright, vice president of Cornell University and director of World War II's Aircraft Production Board. "Ted" Wright had been asked to be a consultant to the current APB on the aircraft program and to make a completely objective report about what should be done.

▶**APB Acts**—These two specific actions were taken by APB:

• **Navy will continue** Westinghouse J40 engine development and push for speeded-up production from Westinghouse and Lincoln-Mercury. (Campbell had recommended the engine be canceled because of production difficulties, with assignment of other engines—Allison J71-A-5, General Electric J73-A3 and Pratt & Whitney's J57 series—to planes for which the J40 had been intended.)

• **Air Force will continue** Curtiss-Wright development of the British-designed Sapphire J65 engine and push for its increased production, both at Curtiss-Wright and Buick. (Campbell report had also recommended canceling the Sapphire for replacement by the other three engines named above.)

Sources close to APB told Aviation Week that a five-page report from Wright to Campbell had been circulated generally through the APB staff and Defense Department and had been generally accepted as a sound approach to the procurement program. (Behind that report was the author's 20 years experience as an aircraft engineer, designer and production expert before he entered government service, and his continued familiarity with new aviation developments maintained as a member of the National Advisory Committee for Aeronautics since he went to Cornell.)

Finality of the Wright report was seen by the fact it was accepted by the board, including Campbell, who had appointed Wright to prepare it in the first place. Furthermore, APB was well enough satisfied with the Wright consulting job on this problem that it designated him as consultant on another important project—guided missiles. This report also will go to Campbell.

WRIGHT: Sound approach to procurement.

Nod to J40

Recent announcement that the Westinghouse J40 engine with afterburner had successfully completed its 150-hr. qualification test helped relieve some of the Aircraft Production Board pressure to cancel J40 Navy contracts, Aviation Week learned last week.

Dr. T. P. Wright, consultant to APB, referred to the completion of this test in his recommendations.

He also referred to the Curtiss-Wright J65 Sapphire engine program along with the program in second-source plants as the most serious obstacle in attaining aircraft production objectives. Air Force has taken responsibility for improving this situation and a reasonable time should be given for improvement. If there are not signs of improvement, it may be necessary to take the matter up with Secretary of Defense, Wright suggested.

Letdown for the Campbell report had been forecast in Defense Department from the days of its disclosure in an exclusive Aviation Week story (July 28, p. 12).

▶**Campbell Report**—Generally, Campbell had requested Air Force and Navy to concentrate on up-dating their air fleets, canceling contracts for less-advanced fighters and bombers and their powerplants and reducing the number of types needed to accomplish identical missions.

Campbell urged concentration on production of a few new very advanced types, some of them not yet ready to fly.

He asked the board, made up of top civilian and military aircraft production planners of Air Force and Navy, to show cause Aug. 6 (later postponed to Sept. 19) why specific contract recommendations made should not be put into effect:

• **Cancelations** of contracts for: Northrop F-89, Lockheed F-94, Grumman F9F and F10F planes, and diversion of production facilities for these planes to build other manufacturers' planes.

• **Cutbacks** of contracts for: Republic F-84G, North American F-86F, F-86D,

Martin B-57, Convair B-36 and Boeing B-47B, along with cutbacks of engines associated with these planes.

• **Increase** contracts and step up to "brickbat" for top priority: Convair F-102, North American F-100, Douglas F4D, B-66, A2D, Boeing B-47C and McDonnell F3. (Observers pointed out that only a few airplanes in the last category have yet reached flight stage and that virtually all are a long way from production in quantity to fill the need for a powerful air arm now.)

Dr. Wright did not comment specifically on the specific model changes Campbell recommended, other than to state that he considered the A-18 schedule for aircraft and the AE-18 schedule for engines "satisfactory," indicating presumably that he did not favor the wholesale changes that had been proposed.

▶ **Wright Warning**—He warned against "over-optimism likely to prevail upon the part of contractors" in regard to experimental models and first production articles; he pointed out that early in World War II programs were hurt by unrealistic and optimistic scheduling, as has again been the case in the current expansion.

It is important, he counseled, that decisions are not rushed on new aircraft and engines to such an extent that basic requirements for successful developments are overlooked. (Implication was that this would have been the case if the recommendations to rush the new airplanes into production had been followed.)

▶ **Better on Paper**—Dr. Wright's report warned against an overzeal to reduce the number of types of military aircraft to a point where they will not do more than a second-best job in meeting specific requirements, thereby compromising success in the mission to which they are assigned.

He emphasized the need for an Air Force in-being adequate to meet emergencies, along with the quality requirement of aircraft that can compete successfully with any possible enemy. Presumably this was an indirect way of saying the U. S. cannot afford to sacrifice today's fighters and bombers now in production until the new airplanes, better on paper, are ready for production and have demonstrated their ability.

Importance of maintaining an industry pace capable of producing planes to meet existing schedules and also capable of rapid expansion in emergency was urged. Competition on designs must be continued to insure the best airplanes, even if only one of two competing models goes finally into production.

▶ **Principles**—The Wright recommendations also suggested some principles for coordination of the work of the military and civilian agencies:

• **Aircraft Production Resources Agency** should handle scheduling for civilian transport planes and engines whenever they are manufactured in the same plant where military schedules will show the total output of these plants and the availability of materials for maximum military ouput schedules.

• **Major fields** for civilian agencies are in facilities, plants, tools, materials and possibly later in manpower.

• **APB should concentrate** on setting up more production lines for current rates of production for more rapid stepup in production when needed in emergency.

• **Clearcut understanding** should be had on responsibilities: Matters of design and requirement are the function of the military services; scheduling is also a major function of the services through the Munitions Board, although APB should be certain the schedules are reasonable before approving them; major civilian responsibility is for tools and materials and for keeping military informed about any shortages of these.

(This obviously is an admonition that the acting APB chairman had gone beyond his proper civilian function in his recommendations prescribing definite contractual actions, preferring some aircraft and engine designs and asking for cancelation of others, instead of leaving these responsibilities to the military services.)

• **Month-by-month charts** for each plant production aircraft should be kept, plotting output by models against time for the A-18 schedule and for six months previous.

• **Civilian agency visitors** to contractors' plants should be sure they get the same story that the military agency gets, by having a military representative present.

• **APB should meet** regularly every two or three weeks, with inspection trips between meetings, including occasional trips to plants by the whole board.

NEW ARMY PULSEJET COPTER TESTED

First photo showing the tiny one-man American Helicopter Co.'s XH-26 liaison helicopter being flown by test pilot Lou Hartwig. Weighing only 300 lb., the craft stands six feet high and can attain 80 mph. It is powered by a single pulsejet engine at the tip of each rotor blade, can be dismantled and reassembled rapidly.

New Jet Liners

- **Three other British firms to compete with DH.**
- **Avro planning delta-wing transport from its 698.**

By Robert B. Hotz

(By Cable to AVIATION WEEK*)*

London—Early success of the de Havilland Comet project has stirred other British manufacturers into plans for jumping into the jet transport market.

• **Avro delta.** Closest de Havilland competitors appear to be Vickers-Armstrongs and A. V. Roe Ltd. division of the Hawker Siddeley Group, with Handley Page also in the picture. (For analyses of Comet development see p. 20.)

Sir Roy Dobson, Avro managing director, told AVIATION WEEK he has submitted specifications for a 107-passenger transport version of the Avro delta-wing bomber. Combat gross weight of the bomber now is about 150,000 lb. Sir Roy believes the delta design is ideal for jet transport application because of the relatively thick wing (more than 9 ft. at wing root of the 698) where both passengers and fuel can be carried.

Conventional construction methods are applicable to building the big deltas, and that also is an attractive commercial feature because it would hold down price.

• **Vickers sweptwing.** Vickers ace designer, George Edwards, has a wealth of experience with U. S. airlines to aid him in adapting the sweptwing Valiant design to economical commercial transport requirements. Vickers is pushing the project privately, but is waiting until

the turboprop Viscount program is further advanced before plugging its pure jet transport plans.

Present internal structure of the Valiant probably would require reworking for a passenger-carrying transport.

• **Handley Page crescent.** Handley Page is basing its jet transport proposal on its H.P. 80 crescent-wing bomber. The transport, designated the H.P. 97, would feature a double-decker fuselage, similar to the Boeing Stratocruiser, with a passenger capacity ranging from 94 to 150 depending on the stage length flown.

The H.P. 97 is designed for a 50,000-lb. useful load over nonstop New York-London run. Direct operating cost is estimated at 1.2 U. S. cents per mile. It would carry 122 passengers eastbound in 6½ hr. and 117 westbound in 7½ hr.

On the 2,200-mi. Cairo-Karachi stage it could carry 148 passengers plus 8,500 lb. of freight in 4½ hr. On the 3,900-mi. Sydney-Singapore stage it could carry 94 passengers.

The 150-passenger version would carry six abreast, plus 16 passengers in the lower deck. Remainder of lower deck would include a luxury bar, toilets and dressing room.

Army Shows Off Its Air Power

Copters and liaison planes are exhibited at Ft. Bragg; convertiplane eyed as service's best transport bet.

By Alexander McSurely

Ft. Bragg, N. C.—You see a heavy cloud of red Carolina dust.

It's not being blown up by any ordinary windstorm. The blast comes from the downwash of the big rotors of 12 low-flying Sikorsky H-19 Army transport helicopters.

And before the dust clears, 100 combat-equipped airborne infantrymen have stepped out of the hovering aircraft and the H-19s are flying away.

Soon the copter shuttle train flys back into the demonstration area, carrying a 75-mm. howitzer suspended under each machine, ready for loading as soon as it is deposited on the ground. Now the gun crew signals for the placement, the helicopter crew trips the gun-sling release and the H-19 moves on again without making a landing.

► **Star Performance**—Next time the sling under each helicopter carries a cargo net full of ammunition and supplies. This time you see a couple of the copters land to airlift litter cases for simulated medical evacuation.

Landing isn't necessary even for this, for the helicopter has a 500-lb. hoist with which to load from the ground while hovering.

You notice that the whole shuttle operation is flown at very low levels, taking full advantage of terrain cover. And you notice the very brief interval in which each copter is poised, hovering 2-3 ft. above its unloading place before it slides into forward flight to get out of the area again.

A star performance of the H-19s, such as this, with a supporting cast of Bell H-13 and Hiller H-23B small copters, and Cessna L-19, de Havilland L-20 and Beech L-23 last week marked a new milestone in Army airborne operations.

► **New Army Concepts**—It was the first demonstration of the Army's new helicopter transport company, integral new part of the Army Transportation Corps, in action. Watching it were Army Undersecretary Karl Bendetsen and other high Army military and civilian industry brass, plus a single aviation press writer—from AVIATION WEEK.

While the show itself, in some respects, was not too different from some that the Marine Corps has done with helicopters, it provided an interesting indication of how the Army Transportation Corps already has picked up its new aviation assignment and is running with it since the weight limitation on Army aircraft has been lifted.

Observers close to the picture expect the aggressive attitude of the Transportation Corps to be reflected in a new and better deal for Army aviation.

Until recently, the remnant of Army aviation left after the Air Force split off was under the not-too-sheltering wing of Army Ordnance. The limitation of 2,500 lb. maximum for fixed-wing aircraft and 4,000 lb. for helicopters had blocked procurement of any larger aircraft which many of the Army aviators felt were needed to make the new airborne-troop concept a reality. The limitation had been imposed by the Joint Chiefs of Staff at Air Force request.

After heated arguments, Army aviation adherents persuaded top-level Army officials that the limitation actually was a block on future Army airborne plans. Finally last November Air Force Secretary Thomas Finletter and Army Secretary Frank Pace agreed to lift the weight limitation (AVIATION WEEK Nov. 5, 1951, p. 17).

Presence of the H-19s weighing approximately 7,000 lb. gross and the Beech Twin-Bonanza L-23 which weighs 5,500 lb. gross demonstrated that less than a year later Army already has procured aircraft heavier than the weight limitation.

► **Future Copters**—And this is just the beginning. On order are the larger Piasecki H-21 which weighs more than 13,000 lb. gross and the still larger twin-engine Piasecki XH-16, with a fuselage the size of a 44-place Convair-Liner and capable of carrying loads of 8 to 10 tons for short distances.

The future of big fixed-wing aircraft for Army is not so clear. Whether the big helicopters coming along will satisfy Army's troop-carrying requirements or whether short-landing large fixed-wing craft will be needed is not yet definitely decided.

Army's position as No. 1 advocate for the convertiplane, which would combine the advantages of fixed-wing and rotary-wing craft, indicates that such a combination is what Army really wants.

► **Troop-Carrier**—Until the convertiplane becomes more than a gleam in the designers' eyes, however, Army will have some fixed-wing assault transports made available by USAF's troop-carrier commands, types such as the Chase C-122 and C-123 and the Fairchild C-119s among piston-engine planes, and later perhaps the turboprop-powered Lockheed C-130.

Experiments with the heavy transport Douglas C-124 have not proved out too well for troop carrying, one Army spokesman told AVIATION WEEK. In a test paratroop drop of some 200 troops from a C-124, the drop left a train of chutes about 2 mi. long, which was not considered practical from a standpoint of concentrating the paratroopers after they reached the ground. Army does not like the landing requirements of the C-124 either.

A review of the 82 aircraft now assigned to Ft. Bragg shows that the Army system calls for assignment of both fixed-wing craft and helicopters as part of the various battalions and companies.

They will then become organically part of the infantry regiment and field artillery and tank battalions and will operate with them in the field. Only exception to this is the helicopter transport companies, which basically are operators of vehicles for the other units.

► **Aircraft Types**—Here is a brief report on current Army types of aircraft demonstrated at Ft. Bragg:

• **Sikorsky YH-18.** Four-place, powered with 245-hp. Franklin engine; developed from commercially certificated S-52. Army considers this copter underpowered, wants at least 300 hp. Sikorsky is considering installing a Continental-built French Artouste 2 turbine engine; carries 750-lb. useful load. Army bought four of present version.

• **Hiller H-23B.** Cost $33,000. Army is getting deliveries at rate of one a day. Three-place, 200-hp. Franklin engine,

skid gear, 697-lb. useful load, 102-mi. range at 70-mph. cruising speed.

• **Bell H-13E.** Has 528-lb. useful load, 170-mi. range at 78-mph. cruising speed, 200-hp. Franklin.

• **Sikorsky H-19C.** Cost $206,000. Carries 1,500-lb. payload 100 mi. or 2,000 lb. 36 mi. Carries ten combat equipped troops, or six litters plus medical attendant. Has 400-lb. capacity hoist, or carries 2,000 lb. slung under the machine without other payload. Powered with Pratt & Whitney 600-hp. engine. Magnesium is used extensively in the machine's construction. Metal rotor blades are made in sections bonded together. Flights have been made with as many as three or four of the sections off one blade without serious effect on the flight characteristics.

• **Cessna LC-126C.** Off-the-shelf version of commercial Cessna 195 is being replaced by larger de Havilland Beaver L-20. Remaining planes are being sent to Ft. Sill, Okla., for use in instrument training of pilots because of the plane's excellent flight characteristics.

• **De Havilland L-20.** Carries pilot and five passengers; 450-hp. Pratt & Whitney. Army is getting delivery of three a month, mostly going to Korea, used as a personnel transport assigned at division level. Cruises at about 134 mph. Has range of about 5 hr. with belly tank. Army pilots say it is deficient in lateral control at slow speeds on final approach.

• **Cessna L-19 Bird Dog.** Standard all-metal front-line liaison and artillery spotter plane also used for light cargo drops. Powered with 213-hp. Continental, 590-lb. payload. Capable of very short landings and takeoffs on small airstrips. Army has ordered more than 2,000.

• **Beech L-23 Twin-Bonanza.** Six-place, powered with two 260-hp. Lycoming engines, 1,730-lb. useful load. Army has ordered 55 with first four due in January; pre-production machines now being flown for familiarization; will be assigned to army headquarters, or corps headquarters, for command transport assignments.

BOEING XB-52 NEARS FIRST FLIGHT TRIALS

Boeing's XB-52, soon to be the second of the eight-jet bomber series to fly, is shown here as it neared completion. The big craft is supported on jacks while its landing gear is installed (top). Note the unusual air intake covers on the paired Pratt & Whitney J57 nacelles and the forward positioning of the power pods. Controls and flaps of the plane cover a large percentage of wing area (bottom). Large flaps extend down and aft in Fowler style; two flap segments are split for flipper aileron mounted between. Forward of outboard flap portion is a three-section spoiler, and still further outboard at the trailing edge is the flush Fiberglas antenna.

IATA Meets

- **Protection of particular airlines is criticized.**
- **Transport group says it could lead to retaliation.**

(*McGraw-Hill World News*)

Geneva—A trend toward local protection by some governments for some particular airline region or route, without regard for the general international pattern, was criticized by officials of the International Air Transport Assn., during the organization's eighth annual general meeting here Sept. 15-19.

These unilateral efforts could prevent steady development of new and highly expensive equipment being purchased in quantity by most carriers and retard growth of international air transport. A big danger is that such methods could lead toward retaliation by other countries, thus bringing chaos to the world-wide traffic system.

IATA's executive committee also recommended that the traffic conference sessions be cut down from twice yearly to once a year, pointing out that this would effect direct savings of $250,000 annually and would be a distinct advantage to the smaller carriers who must operate on lesser budgets and find it difficult to spare personnel.

►**Highlights**—Among other points emphasized during the numerous sessions were:

• Speeding up reduction of paper work necessary for international flying of passengers and cargo. The traffic committee noted that, "In many places still, transit passengers are inconvenienced and services delayed by the imposition of quite pointless formalities." Endorsement of proposals aimed at eliminating visas and police or security clearances for tourists and similar documents was asked.

• Inclusion of the "sell-and-report" system has improved passenger reservation procedures during the past year. Under this method, airlines automatically provide space for passengers booked on their lines by other carriers without necessity for prior requests and confirmations.

• Recommendation that fabrics and

paints used in cabins, cargo holds and undercarriage nacelles be impregnated with synthetic resins containing insecticide, thus cutting costly ground delays for disinfection of aircraft flying international routes. If this method were put into practice, aircraft interiors could be sprayed in flight with a small dose of Aerosol insecticide without inconveniencing crew or passengers.

• Need for research on correlation between pilot age and fatigue. Studies indicate that pilots under 35 tire more easily than those between 35 and 45, but their errors, when made, are smaller. Other tests suggest that captains between 35 and 40, new to command, take more time to recover from fatigue than captains over 40.

• Airlines should ensure their self-protection by examining closely new performance requirements for future transport planes. "The incorporation of airlines views (into proposed government requirements) is of vital importance. . . . Every 150 ft. of runway allowed an aircraft is worth 1,000 lb. of payload to a certain type."

• Mandatory requirements for backward seating were strongly opposed. It was felt that designers should be given a free hand to choose the most efficient method of passenger safety for the particular design they are considering.

• On fully automatic landing equipment, it was believed that although sufficient expenditure of money and manhours could solve the problem, "the number of additional landings it would make possible might not justify the cost."

• Commenting on the earlier Copenhagen studies on approach and landing aid, the technical committee concluded that present location of ILS reference points about 750 ft. down the runway means that aircraft do not use a large portion of the first runway section.

• IATA's legal committee favored new liability provisions now being discussed in Rome. Under the terms of this draft, the airlines would assume absolute liability for any damage caused to third parties on the ground, with liability running $22,110 per person for loss of life. Maximum damage liability, varying with the size of the plane would range from $36,850 to $737,000.

Jets for Mexico

(McGraw-Hill World News)

Mexico City—The Mexican Air Force has purchased its first jet aircraft—four single-seater Vampires and two two-place Vampire trainers—from de Havilland, Britain. The six planes will cost approximately $700,000 and probably will be based at the recently completed new jet field at Santa Lucia, near the capital.

PILOTLESS GRUMMAN HELLCAT roars down the catapult of the USS Boxer off Korea to hit a Communist target. An AD guide plane warms up on the starboard catapult.

Navy Uses Obsolete F6F Drones

In announcing use of "robot" dive-bombers against hotly defended North Korea ground targets, the Navy's Pacific Fleet recently won U. S. banner headlines. The fact that the Navy's robots were obsolete radio-controlled "drones" did not prevent the news from exciting an American public grown weary of constant U. S. losses in the conventional warfare of Korea while the military office at home declared push-button warfare to be just around the corner.

The drones launched from the Navy carrier Boxer were obsolete F6F Grumman Hellcats fitted with remote control, a television camera eye and a 2,000-lb. bomb. They were guided to destruction at the targets by Douglas AD-2s with television receivers.

Navy reports indicate that it has about 1,800 such drones available, but many are needed for anti-aircraft target-practice—the original purpose for which the drones were developed and used before, during and since World War II. All drones are not equipped with the TV "eye" needed for robot bombing, but Navy reports indicate that the installation is cheap and simple.

▶ **Predecessors**—The Navy's Boxer-launched drone attack is the first-known robot bombing since the Korean war outbreak. But Army Air Force used crude B-17 drones (without television) against a few German installations back in World War II.

Navy and Air Force officials in Washington expressed dismay at the way the "robot" news was presented because it tended to indicate that the era of operational use of guided missiles was at hand —"which isn't the case," a Navy spokesman said.

Another Navy official claimed that revealing the television guidance system was a "security violation." However, a complete description of Navy TV-equipped drones appeared in the Navy's July 1951 unclassified edition of Naval Aviation News. This account described how back in March 1942 "a torpedo-carrying TG-2 converted to radio control was equipped with a television 'eye' which transmitted a picture of the target back to the control aircraft and conducted simulated attacks on a destroyer moving at 15 knots."

WCA Contracts to Buy Lake Central

Wisconsin Central Airlines has signed a contract to buy control of the troubled Lake Central Airlines through purchase of the Weesner interests in that line at an undisclosed price. CAB just concluded oral argument on its own charges that John Weesner's management of Lake Central has been guilty of financial and operating irregularities.

The agreement also includes sale of the Weesner's nationwide airlines' application to serve Detroit, Lansing and upper Michigan.

Lake Central owns five DC-3s used on scheduled local service and one C-46 used in military charter flights.

Lake Central routes radiate from Indianapolis to Louisville, Cincinnati, Grand Rapids and Chicago. The acquisition would make WCA one of the largest local service lines, serving 11,000 daily scheduled miles.

▶ **Vital Link**—Purchase of Lake Central would link WCA's system "with Lafayette, Ind., the home of Purdue University, with whom Wisconsin Central recently entered a million-dollar equipment purchase contract," says WCA board chairman Arthur E. A. Mueller. It permits close intergration of the local transportation system in contiguous Midwest areas, he added.

The contract is subject to approval of CAB and the company stockholders.

Some observers expect CAB to make

Wisconsin meet stiff tests of operating efficiency before permitting acquisition of Lake Central. These observers say that WCA's routes have increased so rapidly that costs have been rising, requiring subsidy increases. But WCA argues that merger with Lake Central will make the operation more efficient.

$1.8 Billion For Air Bases

Heftiest part of the $1.8 billion Congress authorized USAF to spend on air base construction is slated to go towards building and improving Strategic Air Command installations at home and abroad. Congress cut the Air Force request back from $2.2 billion sought. Eventually, the airmen hope to get a total of $10 billion for bases to support their planned expansion to 143 wings.

With SAC taking $1 billion for its needs, the remaining $707 million is spread between other continental installations—$65 million for Alaska and $27 million for Far East installations.

Here is the detailed base-by-base breakdown:

Strategic Air Command: $331 million, total.
Major Developments:
- Homestead-Dade County Airport, Fla., $24.8 million.
- Limestone, Me., AFB, $22.9 million.
- Little Rock, Ark., AFB, $23,749.
- Plattsburg Barracks, N. Y., $28.4 million.
- Tye Field, Abilene, Tex., $23.4 million.
- Westover, Mass., AFB, $23.2 million.

Other Expansions:
- Barksdale, La., AFB, $1.8 million.
- Biggs AFB, Tex., $773,000.
- Carswell, AFB, Tex., $13.8 million.
- Castle AFB, Calif., $1 million.
- Clinton NAS, Okla., $9.9 million.
- Davis-Monthan AFB, Ariz., $5 million.
- Dow AFB, Me., $8 million.
- Fairchild AFB, Wash., $9.4 million.
- Forbes AFB, Kans., $15.5 million.
- Hunter AFB, Ga., $5.1 million.
- Lake Charles AFB, La., $6.5 million.
- Lakeland Airport, Fla., $13.9 million.
- Limestone AFB, Auxiliaries A and B, $596,000.
- Lincoln Municipal Airport, Nebr., $9 million.
- Lockbourne AFB, Ohio, $9.9 million.
- Macdill AFB, Fla., $7.1 million.
- March AFB, Calif., $1.7 million.
- Mountain Home AFB, Idaho, $12.5 million.
- Offutt AFB, Nebr., $281,000.
- Rapid City AFB, S. D., $3.1 million.
- Selman Field, La., $18.2 million.
- Sioux City Municipal Airport, Ia., $19.8 million.
- Smoky Hill AFB, Kans., $5.9 million.
- Stead AFB, Nev., $1.5 million.
- Walker AFB, N. M., $3 million.

Air Defense Command: $51.9 million, total.
- Burlington Municipal Airport, Vt., $579,000.
- Duluth Municipal Airport, $704,000.
- Geiger Field, Wash., $744,000.
- Greater Pittsburgh Airport, $976,000.
- Hamilton AFB, Calif., $588,000.
- Houma Gunnery Range, La., $3 million.
- Kinross Airfield, Mich., $740,000.
- Larson AFB, Wash., $10.8 million.
- Majors Field, Tex., $23,000.
- McCord AFB, Wash., $5.8 million.
- McGhee-Tyson Airport, Tenn., $1.1 million.
- Minneapolis-St. Paul International Airport, $450,000.
- New Castle County Airport, Del., $1.7 million.
- Niagara Falls Airport, N. Y., $1.3 million.
- O'Hare International Airport, Ill., $3.8 million.
- Osceola AFB, Mich., $612,000.
- Otis AFB, Mass., $2.4 million.
- Oxnard AFB, Calif., $746,000.
- Paine Field, Wash., $1.2 million.
- Palmdale-Los Angeles County Airport, $280,000.
- Portland International Airport, Ore., $973,000.
- Presque Isle AFB, Me., $451,000.
- Selfridge AFB, Mich., $185,000.
- Steward AFB, N. Y., $3.5 million.
- Suffolk County AFB, N. Y., $2.3 million.
- Truax Field, Wisc., $1.5 million.
- Charlotte County Airport, Fla., $2.7 million.
- Yuma County Airport, Ariz., $1.9 million.

Tactical Air Command: $74.2 million, total.
- Alexandria Municipal Airport, La., $2.8 million.
- Ardmore Municipal Airport, Okla., $4 million.
- Blytheville Municipal Airport, Ark., $11.6 million.
- Bunker Hill NAS, Ind., $18.6 million.
- Clovis AFB, N. M., $906,000.
- Galveston Municipal Airport, $5.7 million.
- Myrtle Beach Airport, S. C., $8.4 million.
- Raleigh-Durham Municipal Airport, N. C., $14.8 million.
- Seymour-Johnson Field, N. C., $7 million.

Air Training Command: $121.7 million, total.
- Big Spring AFB, Tex., $6.2 million.
- Bryan AFB, Tex., $3.7 million.
- Craig AFB, Ala., $2.3 million.
- Ellington AFB, Tex., $4.5 million.
- Foster Field, Tex., $4.3 million.
- Goodfellow AFB, Tex., $3.8 million.
- Harlingen-All Valley Municipal Airport, Tex., $11.4 million.
- James Connaly AFB, Tex., $6.3 million.
- Laredo Mun. Airport, Tex., $4.9 million.
- Laughlin AFB, Tex., $4.6 million.
- Luke AFB, Ariz., $5.1 million.
- Mather AFB, Calif., $5.8 million.
- Moody AFB, Fla., $2.1 million
- Moore Field, Tex., $10.3 million.
- Nellis AFB, Nev., $5.3 million.
- Perrin AFB, Tex., $4.8 million.
- Pinecastle AFB, Fla., $10.3 million.
- Randolph AFB, Tex., $2.6 million.
- Reese AFB, Tex., $7.3 million.
- Scott AFB, Ill., $1.6 million.
- Tyndall AFB, Fla., $1.8 million.
- Vance AFB, Okla., $7.2 million.
- Wichita AFB, Kans., $9.7 million.
- Williams AFB, Ariz., $1.7 million.

Air Materiel Command: $23.4 million, total.
- Birmingham Modification Center, $1.5 million.
- Brookley AFB, Ala., $4.9 million.
- Hill AFB, Utah, $1.6 million.
- Kelly AFB, Tex., $7.9 million.
- Lynn Haven Petroleum Storage Area, Fla., $72,000.
- Norton AFB, Calif., $4.7 million.
- Tinker AFB, Okla., $2.5 million.

Military Air Transport Service.
- Palm Beach County International Airport, Fla., $1.2 million.

Continental Air Command: $1.1 million, total.
- Godman AFB, Ky., $995,000.
- Long Beach Municipal Airport, Calif., $112,000.

Research and Development Command: $67.9 million, total.
- Arnold Engineering Development Center, Tenn., $12 million.
- Griffiss AFB, N. Y., $1.8 million.
- Bedford Research Center, Mass., $10.5 million.
- Holloman AFB, N. M., $990,000.
- Lockland Plant, Ohio, $2.8 million.
- Patrick AFB, Fla., $39.8 million.

Special Weapons Command
- Kirtland AFB, N. M., $8.5 million.

Air Proving Ground Command
- Eglin AFB, Fla., $3.2 million.

Headquarters Command
- Bolling AFB, D. C., $560,000.

Air University: $7.3 million, total.
- Gunter AFB, Ala., $1.3 million.
- Maxwell AFB, Ala., $6 million.

School of Aviation Medicine
- Brooks AFB, Tex., $8 million.

Communications and navigational aids facilities at various locations: $7.9 million.

Outside Continental U. S.

Alaskan Air Command: $65.6 million, total.
- Elelson AFB, Fairbanks, $14.4 million.
- Elmendorf AFB, Anchorage, $31.3 million.
- Galena Airfield, $130,000.
- Ladd AFB, Fairbanks, $14.8 million.
- Maknek Airfield, $3.9 million.

Communications and administrative facilities at various locations: $880,000.

Far East Air Force: $27 million, total.

Strategic Air Command: $1 billion.

HUGHES XH-17 LEAVES THE GROUND

The giant twin-jet Hughes XH-17 flying helicopter developed for the Air Force is seen just a few feet off the ground at Culver City, Calif., during tests of its control system Sept. 19. Under construction for two years, XH-17 has main rotor spanning 136 ft. It is fitted with two General Electric J47s of approximately 5,000 lb. thrust each.

Australian Airlines Register Slump

(McGraw-Hill World News)

Melbourne—A drop in airline traffic and simultaneous steeply rising costs, particularly for labor, are blamed for current mass dismissals of several hundred Australian airline personnel.

More than 200 employes have been laid off by Australian National Airways, about 100 by Trans-Australia Airlines and a number by Ansett Airways. Only a few months ago the carriers were scrambling to get scarce personnel in labor-tight Australia.

ANA and TAA have agreed to cut some competitive schedules, while providing service on alternate days only on long flights between Eastern terminals and Perth.

VISIBILITY by Swedlow in the F-94C Starfire
Pioneer all-rocket Air Force fighter-interceptor, the Lockheed F-94C STARFIRE rises with phenomenal speed to the 45,000 foot bomber attack level.
Its all-electronic radar equipment enables it to lock into target, close, aim and fire with devastating effect. The perfect optical properties of its Swedlow-made transparent enclosures help to make the F-94C a day or night fighting instrument of scientific precision to protect our country from attack by enemy bombers.
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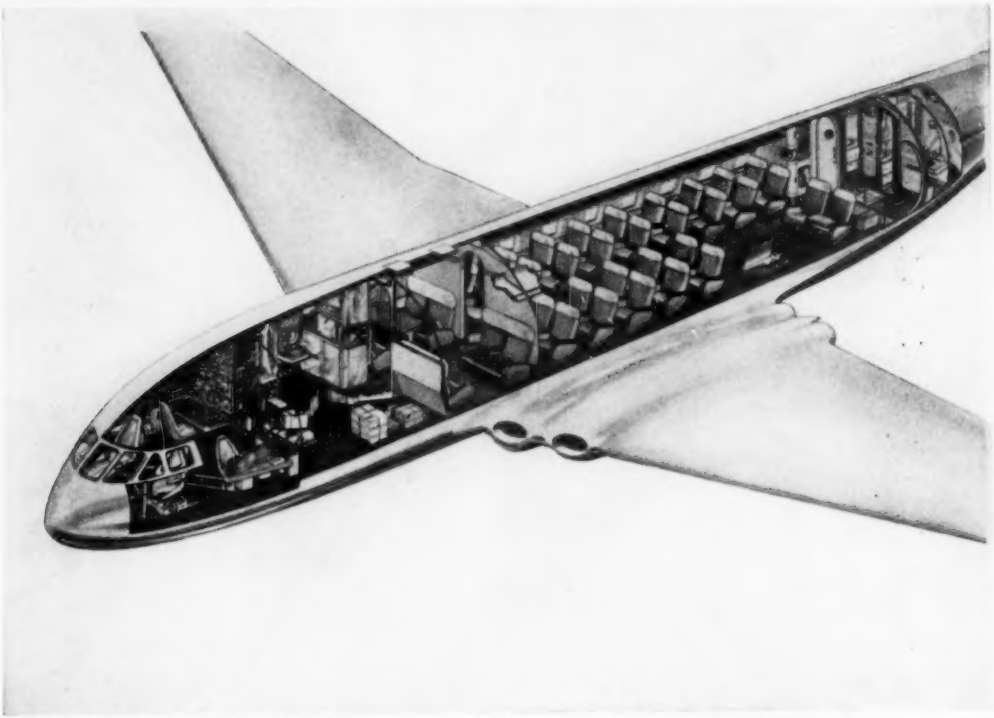


COMET I, WORLD'S FIRST JET TRANSPORT, accommodates 44 passengers in this standard seating arrangement.

Designer Tells of Toil Behind the Comet

- **Bishop's version of 'inside story' is saga of a bold gamble to snare jet carrier lead for the British.**
- **Job took lots of advance planning by de Havilland and cooperation and confidence on the part of BOAC.**

The de Havilland Aircraft Co.'s jet-powered Comet represents more than just a "first" in air transport history. It was a bold—and successful—gamble to span the gap between the steadily increasing American lead and the comparative down-at-the-heels status of British carrier progress.

"We feel that we have a lead on the Americans of between four and five years on jet transport aircraft. They are now in about the same position as we were in 1946." That is the opinion of R. E. Bishop, director and chief designer of de Havilland.

How did Britain achieve this lead and why did the first jet transport emerge as the Comet configuration? Bishop tells the inside story in a recent article prepared for the British publication, The Aeroplane, and the de Havilland Gazette.

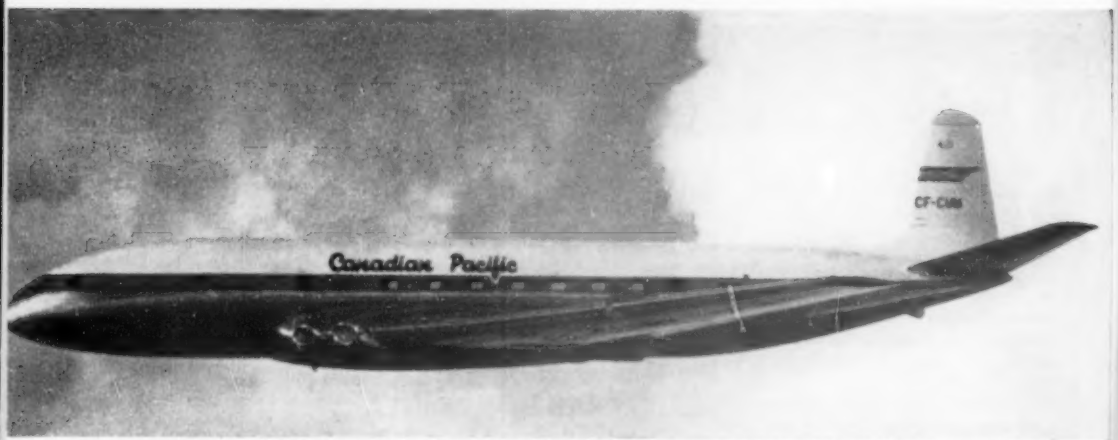
► **Basic Thinking**—Bishop makes it clear at the outset that the Comet was a joint effort of the builder and the operator—de Havilland and the British Overseas Airways Corp. At the end of the war, the American lead loomed large and there seemed no point in bringing out a plane similar to the Lockheed Constellation or the Douglas DC-6—or even aircraft a little in advance of these jobs.

A civil transport built around the de Havilland centrifugal-flow Ghost seemed a good bet. This engine, then just at the test bed stage, was a successor to the smaller Goblin—about which the company had learned a lot in the Vampire fighter.

De Havilland wasn't unaware of the axial flow jet with its promise of better fuel consumption, but at that time—1945-46—the configuration didn't seem sufficiently developed for civil application. Deicing the axial was as yet one unresolved stumbling block, tapping the compressor for cabin pressure and deicing air still another problem not yet tackled. Bishop now takes a look back and justifies the choice of the centrifugal flow engine: "Had we adopted an axial flow engine from the first we should not yet have got the Comet into commercial operation."

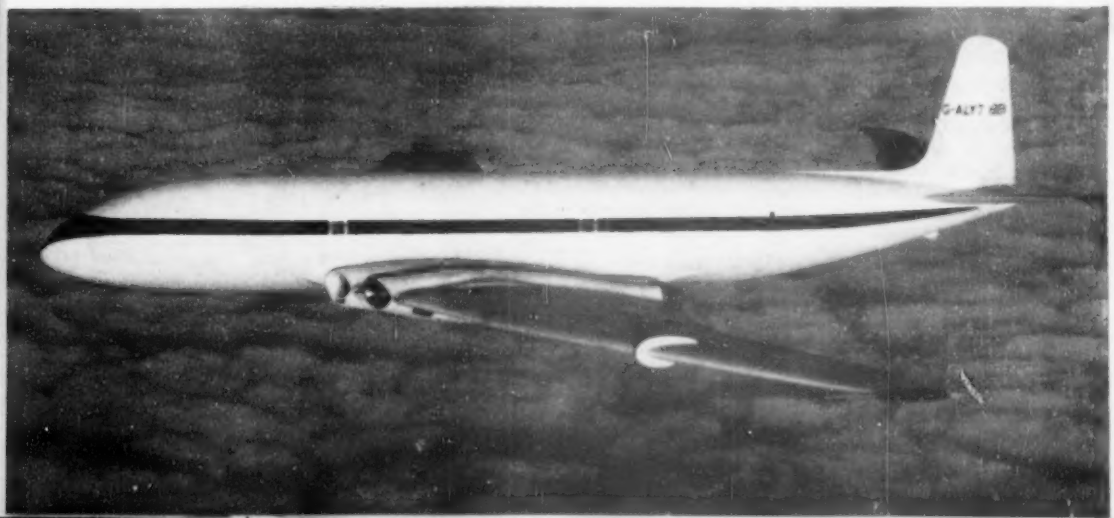
► **Initial Study**—First specification stud-

COMET I First Comet flew July 27, 1949, less than three years after serious design work began. BOAC started proving flights in April 1951, passenger service May 2, 1952.



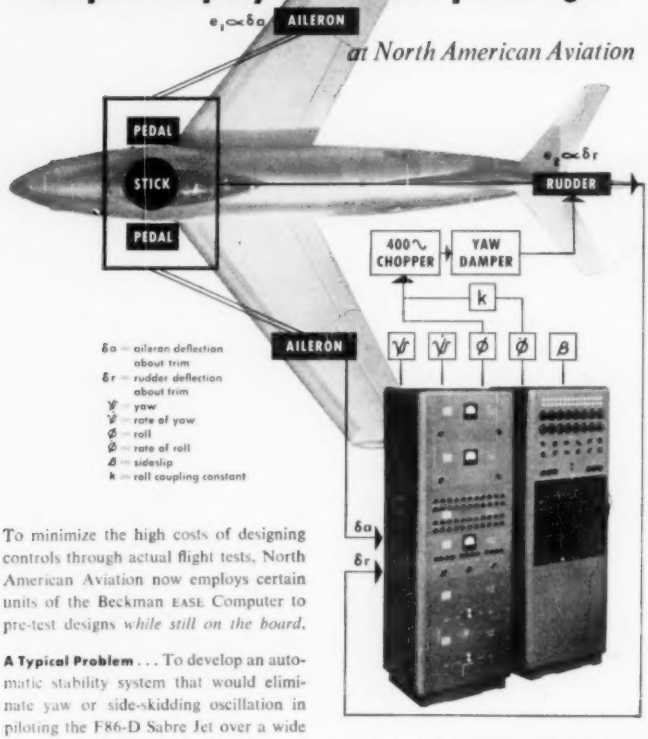
COMET IA First of this series flies in Canadian Pacific Air Lines' colors. Gross weight of this model is 110,000 lb., compared with Comet I's 105,000 lb., and fuel capacity is higher.

COMET II This more powerful series, with four 6,500-lb.-thrust Rolls-Royce Avon engines, first took to the air Feb. 16, 1952. It is designed for longer stages than the Comet I.



Here's how the BECKMAN EASE COMPUTER helped simplify F-86 Sabre jet design

at North American Aviation



To minimize the high costs of designing controls through actual flight tests, North American Aviation now employs certain units of the Beckman EASE Computer to pre-test designs *while still on the board.*

A Typical Problem . . . To develop an automatic stability system that would eliminate yaw or side-skidding oscillation in piloting the F86-D Sabre Jet over a wide range of speeds and at altitudes from sea level to the stratosphere.

How North American Solved It . . . The diagram above shows how North American used certain units of the Beckman EASE Computer to quickly solve the problem by flight simulation. A control-system mockup was designed by engineers at North American which generated voltages proportional to aileron and rudder deflections made by movement of mockup stick and pedals. These voltages were fed into the computer so that its electrical response was analogous to the response of the F86-D in flight. Flight conditions—speed and altitude—were varied on the computer by merely turning knobs.

Airborne performance confirmed the results as developed by flight simulation!

WHAT ABOUT YOUR DESIGN PROBLEMS?

The Beckman EASE Computer is currently being used to solve design problems on such products as guided missiles, submarines, railroad cars, automobiles, military vehicles—and has many other time and money-saving applications in industry and research. It is not only, by far, the lowest priced quality instrument in the field . . . but its unitized design, employing compact rack-mounted components, permits the user to select a custom computer which meets his exact requirements—whether as equation solver, simulator, or tester. Let us study your design problems and make helpful suggestions on applying the EASE to your operations!

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iced related to a fast trans-Atlantic plane which, in addition to 1,000 lb. of mail, was supposed to haul only six passengers. This would have been patterned after a larger Vampire powered by three Goblins. This aircraft scheme came about because there was information that such a high-speed, trans-ocean mail carrier could be used. But de Havilland didn't go for the idea—leaning instead to a truer "airliner" type, drawing on four Ghosts for propulsion. While initially this wouldn't be a trans-Atlantic liner, it was considered a good basic article, with potential for Britain's empire routes.

▶ **Size, Wing Schemes**—When this idea first took shape, the plane was seen as a moderate-size job with a fuselage roughly equivalent to the DC-3—to handle about 24 passengers—but further study brought the conclusion that a larger liner—for about 40 passengers—was justified. Meanwhile, one of the top technical considerations was whether to use a wing that accented high sweepback and elimination of stabilizer and elevators. This also was one of de Havilland's problems in fighter development, so the company decided to study the configuration in an adaption of the Vampire. This emerged as the DH 108 and flew in May, 1946.

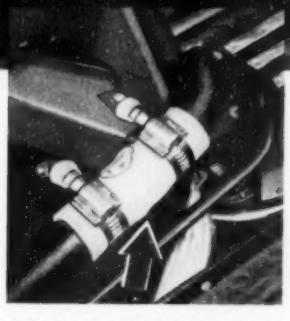
Although this study produced valuable information, it was decided early that a tailless liner, "based on our knowledge at that time" wouldn't be as practical and economical as a more conventional plane. And too much time would have been involved with the study to apply the results to the proposed jet airliner.

▶ **Design to Production**—A key aim in the project was to go directly from drawing board to production. This meant insuring sufficient advance thinking to blend the design with the jet powerplant, coupled with enough realism to avoid experimental extremes. One important endeavor was to retain a moderate wing loading. As the Comet design emerged, it was seen in 1946 as having enough stretch to incorporate the axial-flow engine with its greater power and economy, when it would be developed for civil application.

Bishop gives credit to BOAC for making it possible to skip the prototype in getting the Comet into production. Of course, there were de Havilland guarantees—performance, delivery date and price. The 16 planes involved, 14 for commercial service and two development jobs for the British government, based on 1946 prices, weren't a break-even quantity for de Havilland. But it was a starting order and as such was considered a justifiable risk in going ahead.

▶ **Progress Data**—Span between design

G-E SILICONE RUBBER PAYS OFF



G-E silicone ducting connects tubing carrying hot air to cabins and de-icing systems in the F-86 Sabre Jet. Its temperature resistance (—85 to 500 F) provides a high safety factor. Connection shown made by Aeroduct, Inc., for North American Aviation, Inc., from G-E silicone rubber SS-15.

IN JET PLANE APPLICATIONS

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Capable of withstanding 450 F for long periods, G-E silicone rubber is ideal for fire-wall seals and ignition cable shields in jet engines, as well as for hot-air ducting. And because it stays flexible at —85 F, it provides a reliable sealing material for the doors and windows of high-altitude aircraft.

Typical industrial applications for G-E silicone rubber include spark plug boots and ignition sleeves that stand up indefinitely under high engine heat and deteriorating oils. Seals, gaskets, washers and bushings made of G-E silicone rubber offer unusual temperature resistance, chemical inertness and excellent insulating and dielectric properties.

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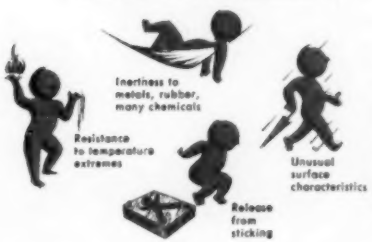
Have *you* investigated G-E silicone rubber *lately?* It's *three times* as strong and costs *much less* than earlier varieties. Send coupon today for a new booklet telling how *you* may take advantage of its unusual properties in *your* business.

THE FOUR BASIC PROPERTIES OF G-E SILICONES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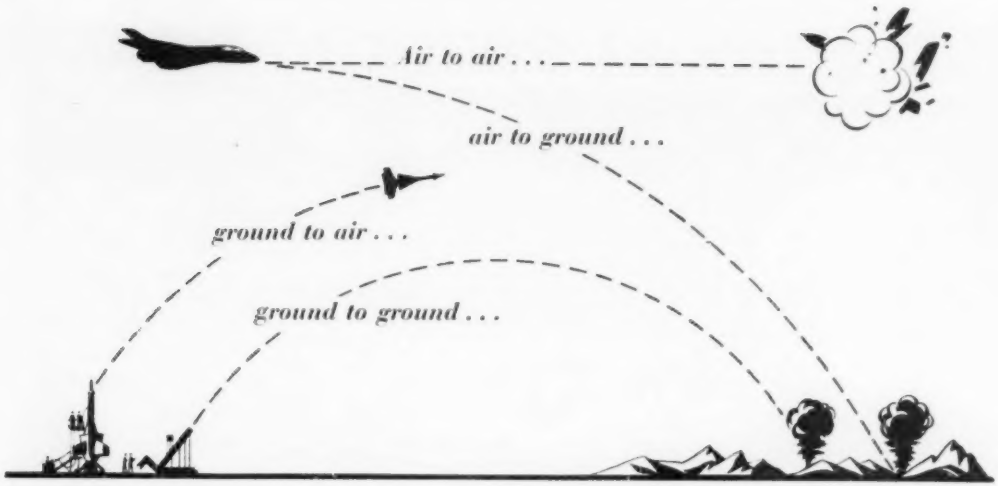
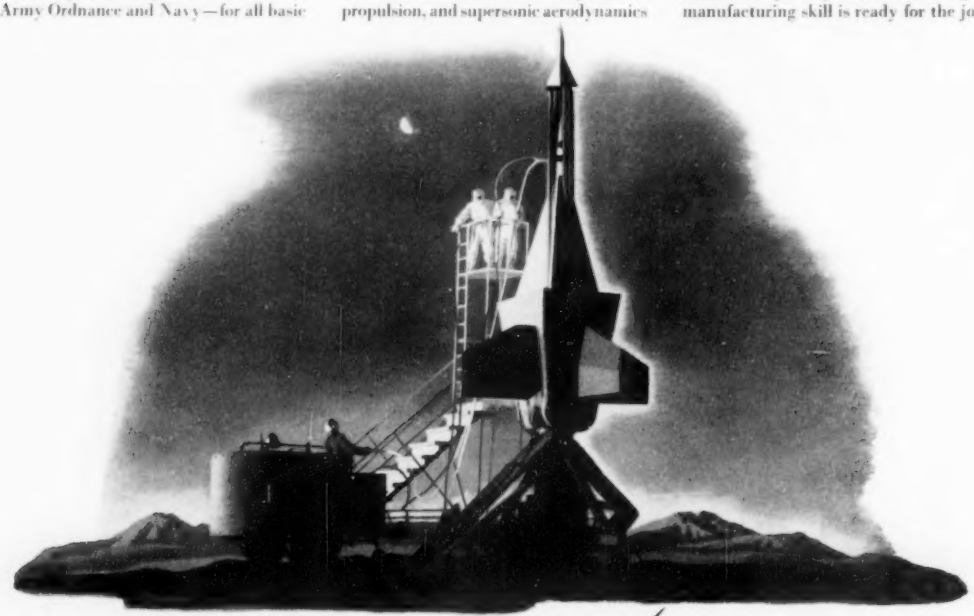


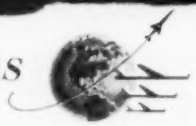
Douglas Guided Missiles

Increasingly important to the nation's defense, guided missile research and development has been a vital project at Douglas for more than ten years.

During this time, Douglas engineers have helped develop missiles for both Army Ordnance and Navy—for all basic uses. Some to be fired from planes *at* planes . . . some from planes at surface targets . . . from the ground at aircraft . . . and from the ground at surface targets. Douglas has contributed to the science of automatic control, guidance, propulsion, and supersonic aerodynamics—and has developed automatic computers needed in guided missile design.

Development of new guided missiles is further evidence of Douglas leadership, and now that the time to produce missiles *in quantity* has come, Douglas manufacturing skill is ready for the job.



Depend on *DOUGLAS*  First in Aviation

start (September, 1946) and the first flight (July, 1949) was less than three years. In 11 months the first Comet chalked up 324 flight hours. One year after the Comet's first flight, the second ship took to the air. With this plane, BOAC began route-proving runs in April, 1951, putting in 500 hr. in six months. In another six months—April, 1952—the Comet was hauling passengers. Bishop's opinion: "Certainly, had we waited for a prototype to fly before starting production, we should have added at least two years to the overall time of getting into service."

► **Redux Used**—In getting the Comet to this point there naturally were many design problems that had to be batted back and forth, then solved. Empty weight was one of the first. Because payload would be little more than 10% of takeoff gross, stress was put on keeping structure (and equipment) weight to a minimum. Fuselage diameter adopted was the smallest compatible with passenger comfort in the arrangement of two on each side of the aisle.

Redux, too, was used for structural bonding. This cement had been employed in the earlier Dove, and de Havilland had extensive experience with it. In the Comet it was applied to both the wing and fuselage, including double curvature applications. In the wing, extruded hat-sections were Reduxed to the skin to permit higher allowable compressive stresses in the skin-stringer combination. This rivetless makeup well fitted the scheme for the integral fuel tanks.

► **Kept Drag Down**—Drag reduction was another factor. The relatively thin wing embodied a thickness-chord ratio of 11%, antennas were buried, windscreen was faired into the fuselage line. To prove the lookout from such a windscreen, de Havilland conducted tests with a special nose on a Horsa glider. The runs established that vision was adequate.

The passenger-altitude relationship was another worry. Cabin heating and insulation was considered a vital factor, because outside temperatures would be as low as −70C at 40,000 ft. Tapping the engine compressor for hot air under pressure was the answer, eliminating cabin blowers and combustion heaters.

► **Fuselage Strength**—Cabin differential pressures were nearly twice those on existing transports and to insure against failure in pressurized areas, Bishop says the fuselage "had to be designed rather like a submarine." In early tests using air pressure on the large fuselage sections, a failure indicated that the only safe procedure was to use water pressure on a submerged section. In addition to the safety afforded, the failure could be localized, whereas with air

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pressure the disruption made it difficult to determine failure origin. Every part of the pressure cabin was tested to destruction.

Pressurized sections were designed to considerably higher strengths than required by regulations. Needing a cabin differential pressure of 8¼ psi., de Havilland designed to 20½ psi. and subjected test pieces to 16½ psi. Fuselage was tested to 11 psi. Windows got special attention, being checked to 82 psi.—a safety factor of 10. Arrangements were made for any of the four Ghosts to maintain cabin pressure supply, and doors and hatches were designed for inward opening.

► **New Materials**—Cold soaking of materials to check on brittleness at the low temperatures of the higher altitude came in for special attention. De Havilland put together a chamber to take the full diameter of the Comet and simulated conditions for 70,000 ft. and temperatures down to –70C.

Bishop says: "We soon found that the standard materials used for such things as bag tanks, flexible hoses, etc., were useless, and a great deal of development work was undertaken before we were able to obtain materials which would remain reasonably flexible after soaking for five or six hours at such temperatures."

► **Controls**—Power-operated flying controls were used, aerodynamic balance posing uncertainties for the designers. Bishop reveals that they were able to put in 200 hr. of flying with the first Comet in the first five months of trials. He says: " . . . I am convinced that had we had normal aerodynamically balanced controls we should have spent the most of this time getting the controls right."

The big advantage of a power control system, he points out, is that it can be properly adjusted on a ground test rig, allows controls with larger chord, larger angular travel. As a precautionary step, the hydraulic rams and valves are duplicated. Primary system operates ailerons, elevators and rudder, a secondary system taking care of the landing gear and flaps. For flying controls, three separate hydraulic power systems are available.

► **Safety Ideas**—Obviously, fire precautions came in for special attention. Hot parts of the buried engines have steel bulkheads for separation from the main structure and the jet tailpipe is shrouded with a steel tube carrying cooling air (AVIATION WEEK, Aug. 25, p. 21). Commenting on jet engine fire risks, Bishop stresses the great need for a reliable means of quick detection, although he does not indicate what approach has been used in the Comet.

On fuel safety, he is very decisive: "I am convinced that one of the biggest steps forward in safety from fire in the air is made by the use of paraffin (kerosene) instead of petrol (gasoline). I hope that there will never be any talk of using in civil aircraft fuels other than paraffin, such as the new American J.P. 4 jet fuel, which is, in effect, a low-grade petrol."

► **Refueling, Noise**—Long ground stops for the Comet are licked with pressure refueling that will push 8,400 U.S. gal. into the tanks in 20 min. Major portion of the fuel is carried in integral tanks, where Redux and bolts eliminate rivets. Bishop says there has been no trouble with the integral tanks.

Noise that might sift into the cabin came in for considerable study. Two rows of seats were shifted from back to front to avoid effects of jetpipe noise. Test flying showed that high-pitch, engine-impeller whine came into the front cabin. Soundproofing didn't supply the answer and eventually it was determined that the noise was transmitted from engine to cabin through the structure. Rubber mounting for the engine licked this problem.

"Although the Comet may not be a lot quieter than conventional civil aircraft," says Bishop, "it . . . has a less unpleasant sound, and . . . there is almost complete absence of vibration . . ."

► **Looking Ahead**—Though de Havil-

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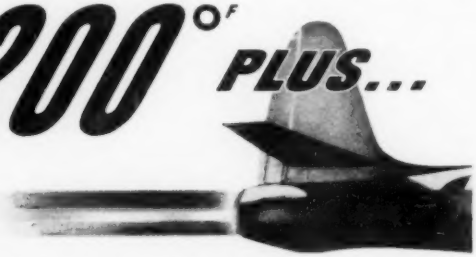

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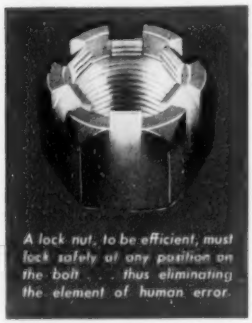

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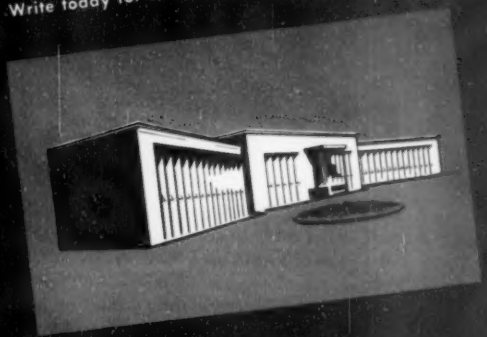

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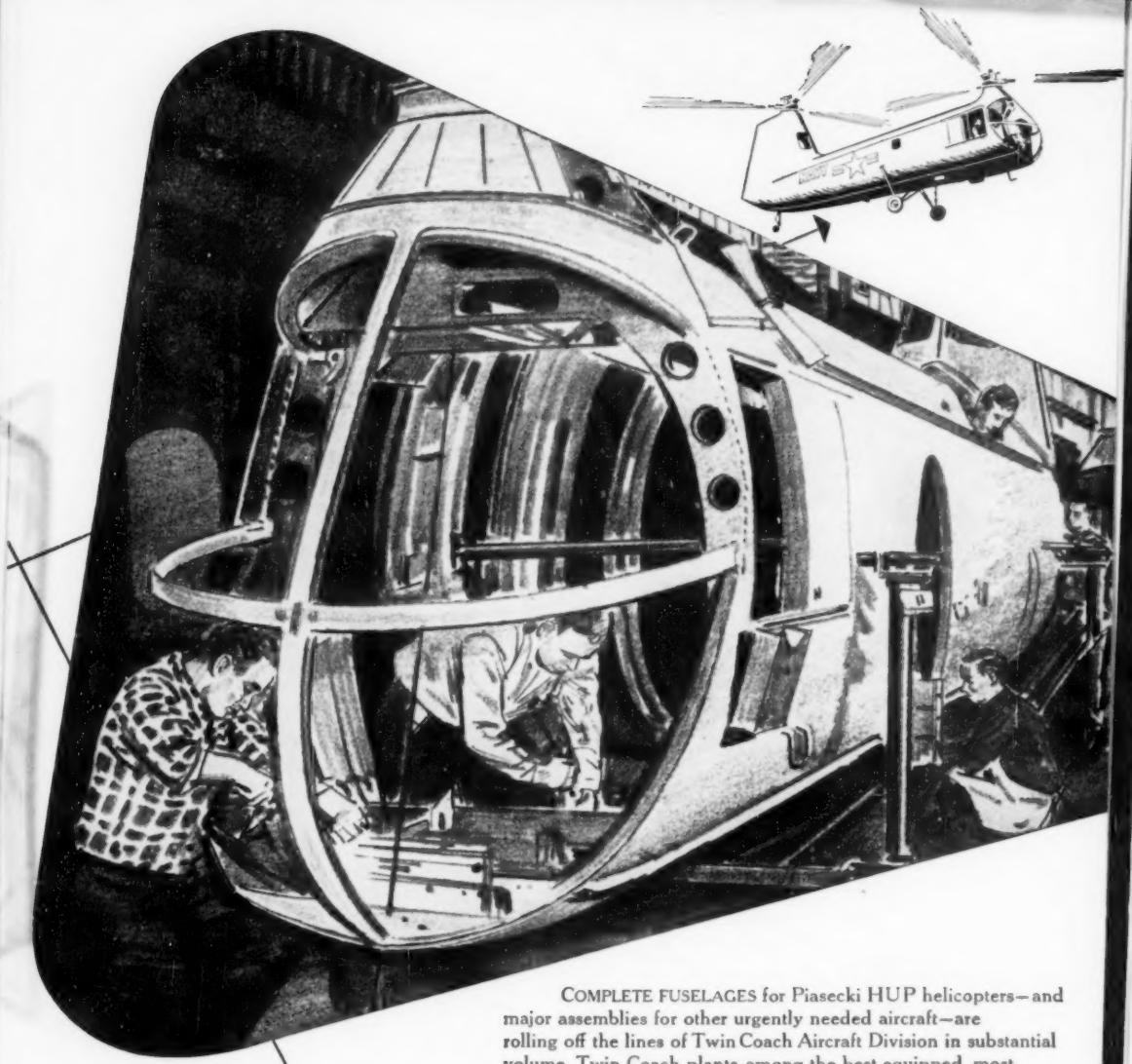

Twin's Early Birds Build Whirly Birds

COMPLETE FUSELAGES for Piasecki HUP helicopters—and major assemblies for other urgently needed aircraft—are rolling off the lines of Twin Coach Aircraft Division in substantial volume. Twin Coach plants, among the best-equipped, most modern in the nation, are competently staffed by men who are the real early birds of the aviation industry. Many have over 25 years of unbroken aircraft experience. Modern facilities, modern equipment plus *experienced* manpower make Twin Coach a dependable source for every type of airframe assembly.

A-5358

Joe Sacco, lofting leadman, constructed and flew his first glider in 1929 while still attending Buffalo Technical High School. He has been in the aircraft industry continuously ever since.

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land feels it is years ahead of this country in the jet transport field, the company isn't complacent, for it is keenly aware of the competition U.S. plane builders will interpose in the next few years. But Bishop puts it this way: ". . . The Comet is an aircraft with relatively low wing loading . . . has plenty of 'stretch' in it. By logical development of the type, and by making use of more powerful engines . . . we hope to be able to keep this lead."

Already, the Series 2 Comet with the axial-flow Rolls-Royce Avon jet (6,600 lb. thrust) is in the picture. This plane, designed for greater stage lengths than the Series 1 (powered by the 5,000-lb-plus Ghost), first flew last February. BOAC is slated to get the Avon-powered Comet in 1954.

And de Havilland probably is thinking beyond the Avon-Comet, with an eye on the Sapphire and Olympus jets for more power and speed for transports yet to come.

PRODUCTION BRIEFING

▶ **Aeroproducts division,** General Motors Corp., Dayton, Ohio, has started installation of new steam heating and dual ventilating equipment in propeller test buildings to aid research.

▶ **Aircraft Engineering & Maintenance Corp.,** Oakland, Calif., recently was scene of a two-day USAF-civilian conference re-evaluating the cycle maintenance of USAF C-54s by civilian contractors, with the aim of bringing procedures closer to those set up by airline industry. Heading the 30-man Air Force contingent was Col. C. H. Dolan, maintenance director, Headquarters, AMC.

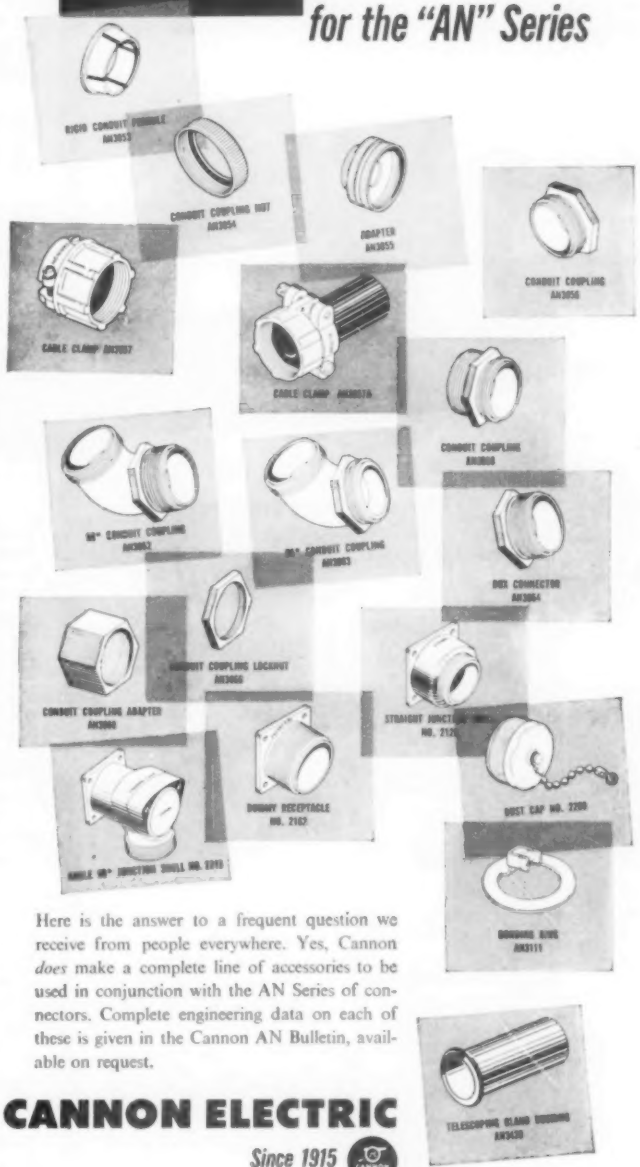
▶ **Ford Instrument Co.,** division of The Sperry Corp., L. I., N. Y., has signed contracts totaling $29.5 million during the first half of this year, twice as much as the same period in 1951.

▶ **Lincoln Park Industries, Inc.,** Lincoln Park, Mich., has acquired a controlling interest in Standard Engineering Co., Detroit. The firm designs and builds complete tooling programs for the mechanical industries.

▶ **Precision Gears, Inc.,** has opened a 12,000-sq. ft. addition to its plant facilities at Paterson, N. J., doubling former space.

▶ **Propeller Service Corp.,** Bradley Field, Conn., has received a one-year contract from the U. S. Coast Guard to overhaul all propellers for its planes. Some 400 props are covered in the agreement.

CANNON PLUG ACCESSORIES *for the "AN" Series*



Here is the answer to a frequent question we receive from people everywhere. Yes, Cannon *does* make a complete line of accessories to be used in conjunction with the AN Series of connectors. Complete engineering data on each of these is given in the Cannon AN Bulletin, available on request.

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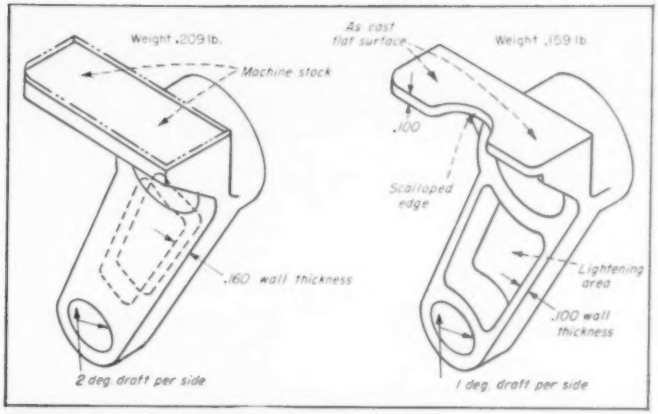

WEIGHT-SAVING EXAMPLE is this Northrop bracket assembly. Lightweight casting design (right), with minimum machining and thinner walls, brings .209 lb. conventional casting (left) down to .159 lb.

They All Watch Scorpion Weight

Most production planes are heavier than prototypes, but Northrop is working to reverse this in the F-89.

"Seven, eleven" may be lucky numbers when you're gambling. But in aircraft design and production they mean a range of additional pounds you'll get in a completed airplane for every pound you add to the airframe. That's because each pound of weight requires additional power to maintain equivalent performance, and added power means more fuel. Both can add up to heavier basic structure.

To eliminate such a result, engineers on the F-89 Scorpion program at Northrop Aircraft, Inc., are cocking super-critical eyes at extra poundage—even at extra ounces.

▶**All Pitch In**—Northrop's plan is to keep every member of the engineering team in the weight-saving game. Each engineer, no matter what phase of work in which he's engaged, is urged to submit ideas for paring pounds. As these ideas are received—and they are coming in by increasing numbers from all sections of engineering—they are carefully processed by department heads in mechanical design and structures.

Many of these suggestions are good. Others, while they may be ideal weight-wise, aren't practical from a cost standpoint. But whatever the decision on the suggestion—negative or positive—or the plans made for further processing, the suggester is advised as soon as possible of the item's status. This may seem like a lot of routine detail, but Northrop finds it to be an important factor in encouraging further suggestions.

▶**Suggestions Broad**—Recently submitted suggestions have included elimination of certain equipment, change in material, approved deviations from specifications, changes in manufacturing

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procedures, etc. Some of the latest suggestions call for:

- **Titanium in place of steel.**
- **Bare aluminum** in place of cladded material, to take advantage of higher allowables.
- **Sand castings** with wall thicknesses of 0.1 in. or less where strength permits.
- **Changing supply source** when a lighter part can be obtained.
- **Tungsten alloy** in place of lead for balance weights in control surfaces.
- **Calling for specific vendors** on drawings in order to obtain the lightest purchased part.
- **Review of necessity** for joints or splices.

▶**Target Weight**—Northrop complements its suggestion system with another device to promote interest in weight-saving. This is a special newsletter—"Target Weight"—circulated bimonthly to engineers, and it's been found effective in the battle.

Because past experience in the industry has shown that airplanes increase in weight from the time the prototype flies until the production version is ready for flight, Northrop weight engineers have set up a "target weight" value. This is 4% under specification weight and everyone connected with current designs is urged to hit this target.

Target Weight tells the current weight of the plane, the target weight and the change since the last report. Compiled jointly by Producibility Engineering and the Weight Section, it includes information on armament, fuselage, controls, electrical, equipment, hydraulics, landing gear, powerplant and wings.

In addition to the newsletter, a detailed breakdown of target weights compared to current weights is furnished each design section for the components for which it is responsible. Reviewing this comparison, design supervisors can determine which items overshoot the target, and then check the possibilities of changing the design to meet the goal.

▶**Small Savings Scrutinized**—But even target weight isn't a final aim. By constantly seeking minimum weight, final weight can often end up below target. Even in face of the constant reminder that 1 lb. added to the airframe can bring a 7 to 11 lb. increase in the completed plane, the question is often raised whether small weights—0.1 or 0.2 lb.—are worth consideration. Northrop thinks they are. For it is the large number of small weight reductions, plus only a few, if any, large reductions that ultimately result in "minimum weight" aircraft.

One way to reach a conclusion is to determine the percentage of change. Because target weight is, on the average, only 4% under specification weight, a reduction that approaches or exceeds that value is considered worthwhile regardless of how small the actual amount.

Example: Two capacitors, functionally identical, weighed 0.017 and 0.023 lb., respectively. Weight difference was only 0.006 lb., but increase in weight of the heavier unit amounted to 35%—considerably higher than the 4% aimed for. So the change was worthwhile.

▶**Specific Operations**—Northrop finds weight reduction on detail parts a very important factor. Milling, turning, drilling, sheet metal shearing and routing operations in the F-89 program all offer worthwhile savings. It's been found that the extra cost of milling is justified in many instances.

- **An extra straight milling** operation which removes 0.4 cu. in. of aluminum or 0.2 cu. in. of steel is considered justified from a cost per weight standpoint.
- **In turning jobs,** an additional operation which removes 0.1 cu. in. of aluminum or 0.05 cu. in. of steel is justified when the operation is to be done under the same setup as another operation. If a separate operational setup is required, a saving of 0.4 cu. in. of aluminum or 0.2 cu. in. of steel is felt necessary to justify it.
- **It is deemed economical to drill** holes ¼ in. or larger, to remove 0.04 cu. in. of material.
- **In sheet metal operations,** it is con-

BALANCING
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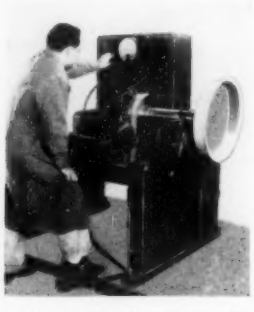

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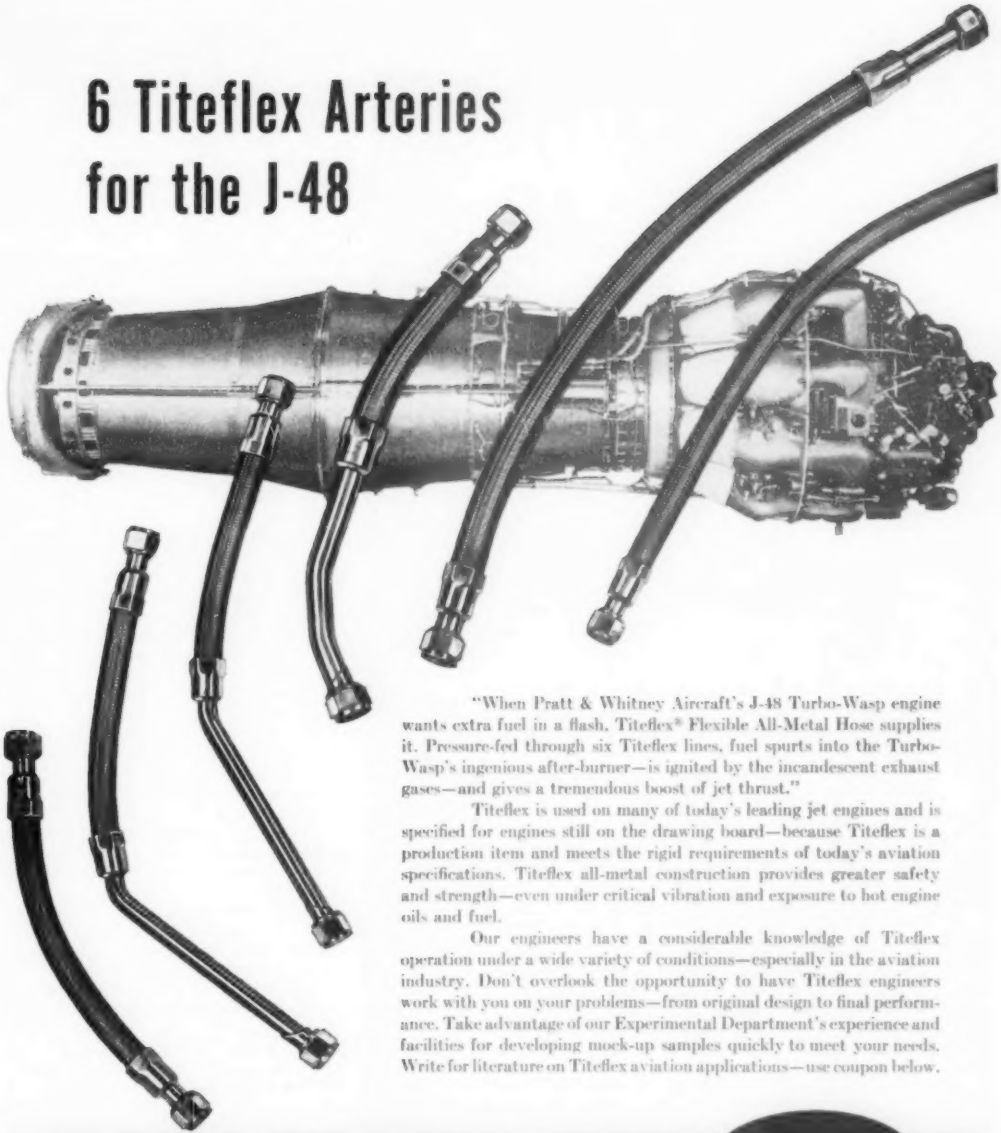

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sidered practical for weight reduction to include additional shearing to eliminate 0.005 cu. in. of aluminum or special shearing operations which eliminate 0.007 cu. in. of aluminum.

• **In routing operations**, all corners of sheet metal parts which do not have to be squared are rounded. Northrop feels that on its routed parts it can incorporate irregular edges or holes to save weight without appreciable increase in cost.

▶ **Department Teamwork**—Process Engineering at Northrop is proving particularly helpful in keeping weight engineers advised of acceptable material substitutions which will result in weight-savings.

Weight engineers are continually working with the process groups to extend the use of aluminum alloy bolts and nuts to many applications where strength permits. Also being studied is the application of nuts and bolts made of titanium, for additional weight reduction.

Producibility Engineering coordinates the efforts of the weight and design sections from a cost standpoint, using the allowable dollar value to save a pound as a measuring criterion to promote an efficient weight-saving control.

▶ **Vendor Participation**—Vendors, too, are enlisted in the program.

Here's a typical example of vendor participation: For one model of the F-89, Northrop chose a group of 12 prints from casting drawings still on the boards, and provided a set of them to a number of foundries. These were asked to mark the prints for the lightest casting configuration possible by their particular process, with reference to minimum draft angle, web and wall thickness.

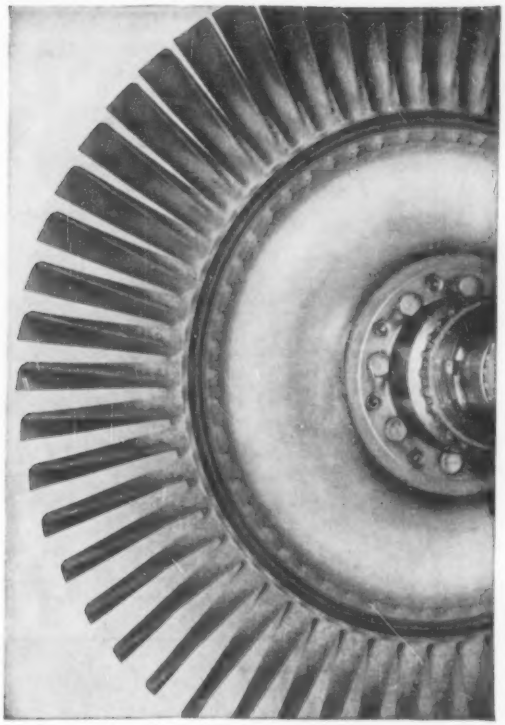
When the vendor-marked prints came in, Northrop engineers computed the weights of the marked-print castings and conventional castings. For the 12 examples chosen, the average weight saving amounted to about 0.236 lb. per casting. With this coopcration from the vendors, Northrop was able to get a total weight-saving of approximately 15% per casting.

West Coast Firms List Titanium Needs

West Coast materials engineers are anticipating the day when titanium—the big-potential metal for aircraft and engines—will be stocked in that area. Right now, the metal is expensive and not plentiful, so warehousing isn't feasible. But when supplies increase and cost drops, stocking titanium will be a routine phase of material supply.

Trying to keep ahead of this situation, the Metals Stocklist Subcommit-

UTICA HELPS



Turbine assembly of P&WA's Turbo-Wasp after 500 hours of actual operation. The Turbo-Wasp is one of the great engines for which Utica supplies blades.

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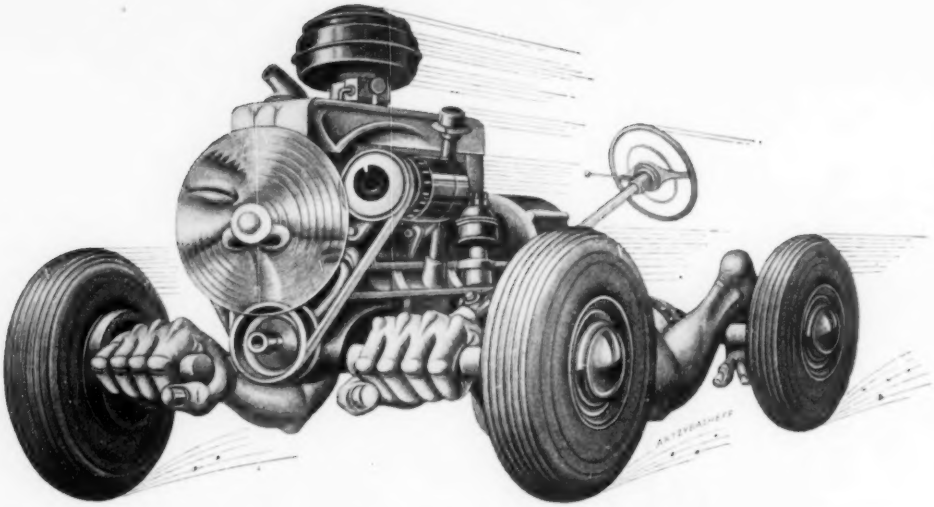

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AVCO MANUFACTURING CORPORATION

tee of the National Aircraft Standards Committee, headed by Northrop Aircraft, Inc.'s Glenn Aron, recently met at Los Angeles to prepare a recommended standard list of titanium sheet, plate and bar stocks. NASC is an activity of the Aircraft Industries Assn.

Attending the subcommittee discussions were representatives of four major titanium suppliers—Rem-Cru, Titanium Metals Corp., Mallory-Sharon and Republic Steel—and about 50 aircraft metals companies and warehousing officials.

Prestretching May Cut Plastic Crazing

The crazing of transparent plastic, used in aircraft may be reduced considerably if a new technique, developed by the National Bureau of Standards, is adopted.

The Bureau says that suitable prestretching of the plastic may be the means for increasing crazing resistance. This conclusion is part of a study sponsored by the National Advisory Committee for Aeronautics; the study grew out of the lack of available information on the effect of forming on crazing and strength of acrylic plastic.

▶**Test Procedure**—A typical astrodome served as the first takeoff point. It was found the material was stretched about 40% to 50% in the plane of the plastic at the apex of the dome.

First samples were made to duplicate stretching of this typical astrodome. Specimens were taken from formed and unformed pieces of material and subjected to standard tensile, stress-solvent crazing, long-time tensile and weathering tests.

The tests on stress-solvent crazing showed that biaxial stretching increased the threshold stress (point where crazing is considered to begin) about 75% for both general-purpose and heat-resistant grades of plastic. Cracks on the formed specimens were somewhat finer and more closely spaced than on the unformed surfaces.

▶**Improvement**—This improvement has suggested that enclosures made from stretched sheets have superior crazing and strength properties when compared with enclosures formed with little or no stretching.

As an alternate to using prestretched material, a larger and more deeply drawn enclosure could be made, and only its central portion used.

The structure of the prestretched acrylic sheet offers one more valuable possibility. It would seem likely that resistance to shattering by shrapnel of pressurized acrylic canopies could be obtained without the necessity of using the heavier and more-expensive plastic laminate made with vinyl interlayer.

(Advertisement)

Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Marvin Miles,
Senior Member, Aviation Writers Assn.

Meet "Senator" Art Cocagne—serious and reflective, horn-rimmed and bow-tied, yet with easy wit and a good grin.

A Whittaker field engineer, Art several years ago found himself labeled with the nickname because he himself had fallen into the habit of addressing others with the title.

So now he's a senator without a state; or rather he's a valve diplomat with several states, for his territory stretches from St. Louis to the Ohio border and north and south across the nation.

Typical of a score of Whittaker field men, Art has an intense dual allegiance—to company and client as well. He knows the problems of each, works for the mutual benefit of both.

If you should ask Art his psychology in handling one of the fastest-growing valve regions in the country, he's likely to answer:

"Don't think you'd call it psychology. It's just a matter of helping all our customers any way you can, and fast. You figure their commitments are your commitments.

"It's like being a combination of doctor and jack of all trades. You're on call 24 hours a day. Emergencies are always cropping up along with routine chores. Frequently you sit it out with the patient until a given problem is solved. It's the only way to get the job done properly."

Major companies that Art serves, with the able assistance of Boyd McKinney, are Allison at Indianapolis; General Electric, Cincinnati; North American, Columbus; Lockheed, Atlanta; McDonnell, St. Louis; Ford, Chicago; Studebaker, South Bend; Packard, Detroit, the latter three all building jet engines.

The 34-year-old former Air Force pilot knows valves through and through. Perhaps more important, he knows the value of competence, confidence and cooperation.

A good example of the Senator's work—and typical of many another case history in the files of Whittaker field engineers—is the A-16 fuel transfer valve for Allison's J-33 jet engine.

The Navy advised Allison it wanted a manually operated transfer valve as quickly as possible, a unit that would handle a high speed switch in fuel supply without appreciable loss in r.p.m.

Allison called in the Senator, among other valve company representatives. "No such valve was in concept, much less design," Art recalls. "We had to start from scratch without even an idea of envelope."

Within days, Whittaker sent off preliminary drawings. These were approved and the valve company went to work. In less than two months the first valve had been designed, built and tested in Los Angeles and shipped to Allison for standard 150-hour run-up tests.

"The Allison engineers, a Whittaker engineer and I really sat up with that baby," the Senator grins. "It was a matter of coordination and cooperation between companies and it worked out beautifully.

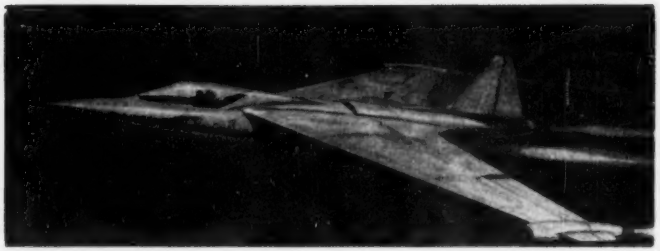
"Sometimes we worked until 4 a.m. Three valve models shuttled back and forth between Los Angeles and Indianapolis, with constant long distance telephone conferences matching the urgency of the deal.

"Together we wrestled through five major changes and came up with a valve that would operate in three-tenths of a second and switch a 600 p.s.i. fuel feed at 11,700 r.p.m. within plus or minus 200 r.p.m.

"By taking the bull by the horns we met Allison's need and Allison met the Navy's need. That's the way it should be."

Thus Art feels about his job. And he'll tell you with pride that the same transfer valve, in quantity production, was constantly improved by Whittaker initiative over the succeeding twelve months, reduced fifty percent in size and almost as much in weight.

As for the Senator's lighter side, if you should meet him ask him about his Indiana smokehouse. . . .



TODAY'S ANSWER to tomorrow's aero problem: Artist's version of one highspeed, high-heat-resistant supersonic Mach 2-3 aircraft scheme incorporating glass-plastic laminated makeup, even to rivets.

Glass-Plastic Plane for Future?

Need seen for new aircraft structural materials, as high heat at high speeds weakens today's metals.

Los Angeles—Test pilots flying the sleek experimental aircraft out of USAF's Edwards base in California now speak of the once-dread sonic barrier in the same way a Sunday driver might talk about a bump in the road.

Bill Bridgeman, who has taken the Douglas D-558-II Skyrocket to altitudes and speeds no other man has ever reached (AVIATION WEEK July 16, 1951, p. 14), says the needle-nosed rocket craft went through the sonic wall with the ease of a tiger going through a paper hoop.

▶ **Heat Action**—But these pilots, as well as the scientists and designers who build the planes they fly, have long known that a more formidable barrier lies in the high speeds ahead of them—the heat barrier.

A pilot flying the Skyrocket had this demonstrated graphically not long ago when the refrigeration equipment on the D-558-II failed while he was six or seven minutes from the base. He became a truly "hot pilot," almost passing out from the heat before he could get the supersonic craft on the ground.

And this high-heat condition can do strange things to aircraft, aero scientists discovered. Aluminum and magnesium alloys can lose their strength. Wings and skin surfaces can warp and twist out of shape.

The heat results from the friction of air against skin surfaces as the aircraft flashes through the atmosphere at supersonic speeds. And as the kinetic energy is transformed into heat energy, the resulting temperature rise is directly proportional to the square of the velocity. Thus, as the speed of a plane doubles, the ram temperature rises fourfold.

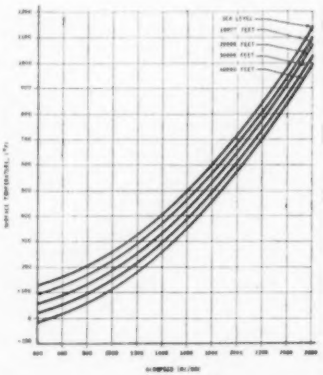
At the near-1,300 mph. which the Skyrocket has reached, this ram compression temperature is about 260F. This climbs swiftly to slightly more than 1,000F at 2,600 mph. German scientists found that surface temperatures on the V-2 rocket exceeded 1,500F.

At 500F the strength of the best heat-resistant aluminum alloy (24S-T) drops 70% after continued exposure. For 75S-T aluminum alloy, the loss is 80%.

▶ **Answer for Tomorrow**—Unlike the sonic barrier, the heat barrier is not a wall which the aeronautical scientists expect to break through. There is no "other side." The faster a plane flies, the hotter it gets as long as it remains in the earth's atmosphere.

What then can be done to lick the problem? There is a limit to refrigeration. An answer must be found soon, for the airplane of tomorrow is on the drawing boards of today. What will it be like?

One startling answer has come from Thomas E. Piper, director of materials and process engineering for Northrop Aircraft, Inc. The airplane of tomorrow may be a glass airplane, he says.



SURFACE TEMPERATURE vs. airspeed at various altitudes (USAF summer day).

Piper's dream plane, shown in the accompanying artist's sketch, has glass wings, glass ailerons, glass stabilizers and an all-glass fuselage. The airframe is molded from plastic materials. It is held together with glass rivets. Its engine, using a new fuel and lubricated with a dry heat-resistant metal powder, can hurtle it through the air at more than 2,000 mph.

"This aircraft is not just an artist's fantasy," says Piper. "It must be built if airplanes are to fly successfully at two or three times the speed of sound."

▶ **Material**—The glass-plastic laminates this airplane of the future employs offer many favorable characteristics at high speeds:

• **The strength/weight ratio** of the resulting material is favorable and a high percentage of strength is maintained at temperatures around 500F.

"Phenolic - resin - impregnated, glass-fabric laminate, having a tensile strength of 80,000 psi. at room temperature, experiences little or no loss in mechanical properties at 300F and maintains a strength of 35,000 psi. after an exposure of 100 hr. at 500F," says Piper.

• **This laminated material** has a lower coefficient of expansion than a metal structure. Thus, changes produced in different parts of the aircraft by varying exposure to heat will be less severe than in metal aircraft. This will tend to eliminate the warpage which causes critical control problems.

"This is due not only to the low heat-transfer properties of the molded laminated structure but also to the fact that it is integrated with like materials possessing uniform coefficients of expansion instead of dissimilar metals having different coefficients," Piper points out.

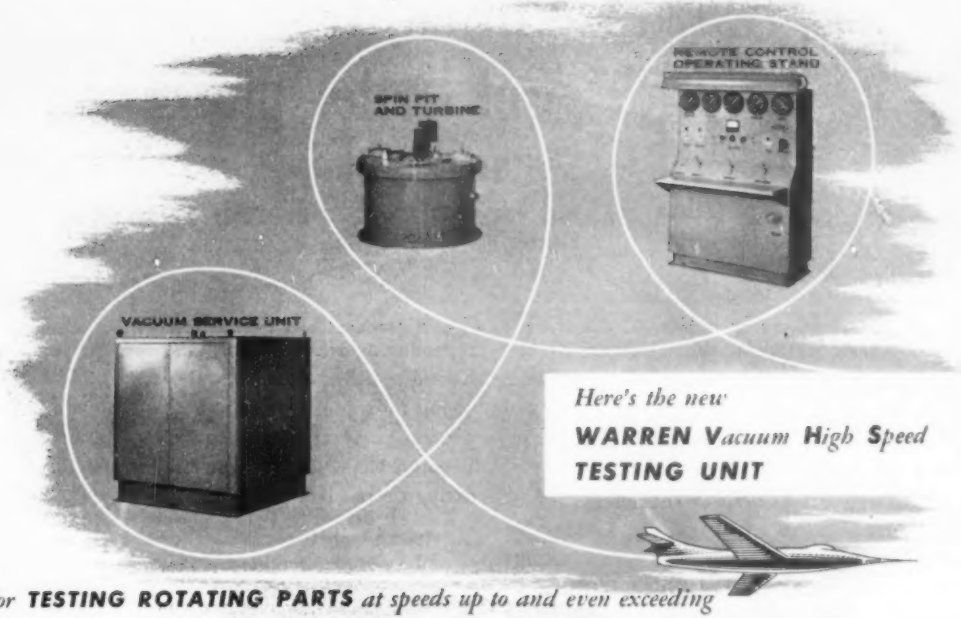
The material also is more flexible than metal.

• **Simplified tooling** will reduce production costs by a large amount, since Piper believes it conceivable that an entire airframe could be formed from plastics in four or five basic molds, with only a handful of skilled workers needed.

• **Increased aerodynamic smoothness** would be achieved through elimination of many rivets, screws and skin joints. Each molded surface produced would have the same contour as each preceding part, says the Northrop Aircraft engineer.

▶ **Fuel**—New fuels will be needed to power this sweptwing fighter as it streaks through the atmosphere at Mach 3 speeds.

A fuel must be found with such a low vapor pressure that it will not boil at the pressures and temperatures produced in the fuel system. Refrig-



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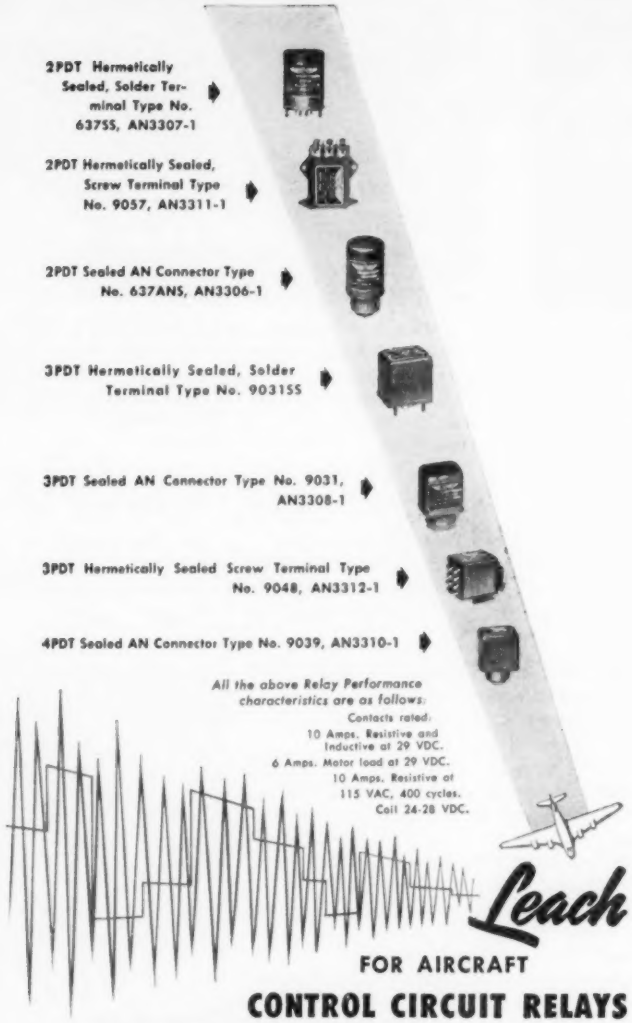
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eration of the fuel tanks has been suggested to take care of temperature conditions.

▶ **Lubricants**—Since wet lubricants developed for temperature ranges from 350 to 700F probably will be unsatisfactory over the great extremes of temperature at which this fighter will operate, new lubricants must be found. These future high-temperature lubes, Piper believes, probably will be of the metallic dry-powder or dry-film type such as molybdenum disulfide, with or without a carrier.

▶ **Rivets**—These glass fasteners will have undirectional fibers impregnated with silicones or phenolic resins. High temperatures will produce no differential expansion between the rivet and the material being joined, the Northrop engineer explained.

▶ **Other Characteristics**—Several problems presented by the heat barrier are solved by this imaginary fighter of the future. The canopy will be a silicate glass instead of the present methacrylate plastic. All sealing applications will use new heat-resistant rubber-like materials.

Surfaces will be finished by a new technique—"Highspeed aircraft of the future must maintain a more perfect surface than the finest baby grand piano made today," Piper points out.

▶ **When?**—The Northrop engineer believes this fantastic glass airplane of the future is much closer than many people realize.

"The highspeed combat plane of the near future must be built of something other than conventional light-metal alloys," Piper insists. "A complete military combat-type airframe designed specifically for glass-plastic materials and manufacturing methods is considered entirely within the realm of possibility."

A set of glass-plastic wings already has been built by British airframe manufacturers. These wings will be flight tested in about six months. American firms also are considering extensive structural use of glass-plastic materials, he said.

Northrop has been doing experimental work on the glass rivets, Piper admits, though as yet results have been unsuccessful.

And the Northrop executive, apparently realizing that people who dream up glass airplanes shouldn't throw stones, also admits that developments in titanium, lightweight steel, and new magnesium and aluminum alloys may find a place in the air force of the future.

For a while at least, Bill Bridgeman and the other supersonic test pilots at Edwards still must sweat out the heat barrier in present old-fashioned metal airplanes.

—William J. Coughlin

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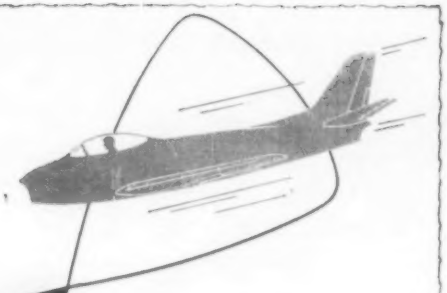

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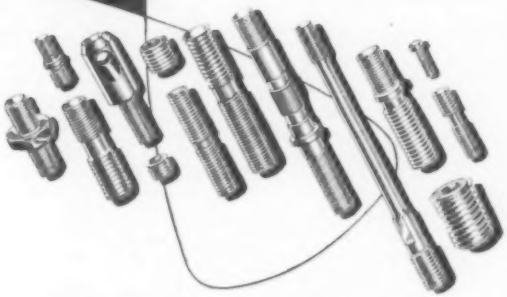

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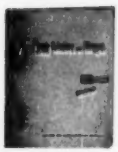

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British Study Pod-Copter Service

Helicopter and detachable fuselage (pod) arrangements shown above are passenger- and cargo-hauling scheme planned by Silver City Airways Ltd., British carrier, for cross-Channel traffic.

The copter proper, as prime mover, would be upper portion (black) of the combination, with the pod compartment (white) below to accommodate 12 passengers in the nose and two automobiles, motorcycles and bicycles in the freight area behind.

The general configuration planned is similar to the Pack Plane built for USAF as the XC-120 by Fairchild Engine & Airplane Corp. (AVIATION WEEK Nov. 13, 1950, p. 22).

Operation envisages passengers and cargo being put aboard a waiting pod while a copter with pod attached flies across the Channel in the 10-min. trip from the opposite terminal. Touching down, the copter's pilot throws the switch that releases the attached pod. The copter rises again, settles over the waiting pod and hooks on to it for another flight, the quick turnabout representing an almost continuous operation. Silver City has already issued a specification for the rotary-wing configuration to a number of British constructors.

Space Talk

- **Rocket Society papers point to outer flight.**
- **Radiation hazards in upper air discussed.**

Progress in rocket science—with the accent on the problems of space travel—highlighted the Fall meeting of the American Rocket Society at Chicago, Sept. 9 and 10.

Of nine technical papers presented at the three sessions of the meeting, three dealt directly with flight in outer space, and two considered the implications of research at the lower strata of space.

AVIATION WEEK presents, in the following paragraphs, the authors' summaries of four of the papers prepared for the ARS meeting. The remaining presentations will appear in a succeeding issue of AVIATION WEEK.

▶ **"Rocket Upper Air Research," by Homer E. Newell, Jr., Naval Research Laboratory.**

Following the free balloon experiments of Teisserenc de Bort in the closing years of the last century, the atmosphere above the region in which the normal weather processes occur was at first believed to be at a constant low temperature. In the ensuing decades, however, inference from sound propagation experiments, meteor observations, and ionospheric and sky light studies led to the conviction that atmospheric temperatures varied widely with altitude. During the course of these many investigations, the picture of the atmosphere changed to a vastly complex picture involving a quasi-stratosphere of about 20 kilometers height, a warm ozonesphere from 15 to 50 kilometers altitude, an extremely cold region in the neighborhood of 80 kilometers, ionospheric layers centered at 60, 100, 200, and 400 kilometers roughly, and thousand degree temperatures at great heights.

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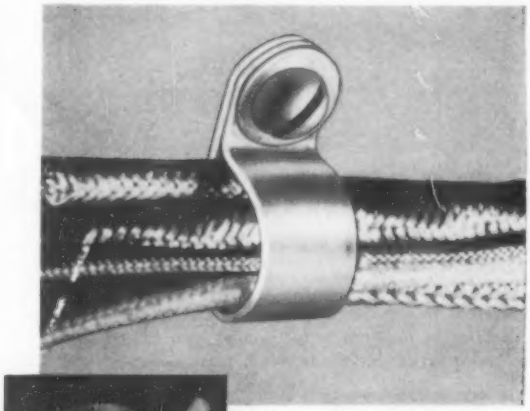

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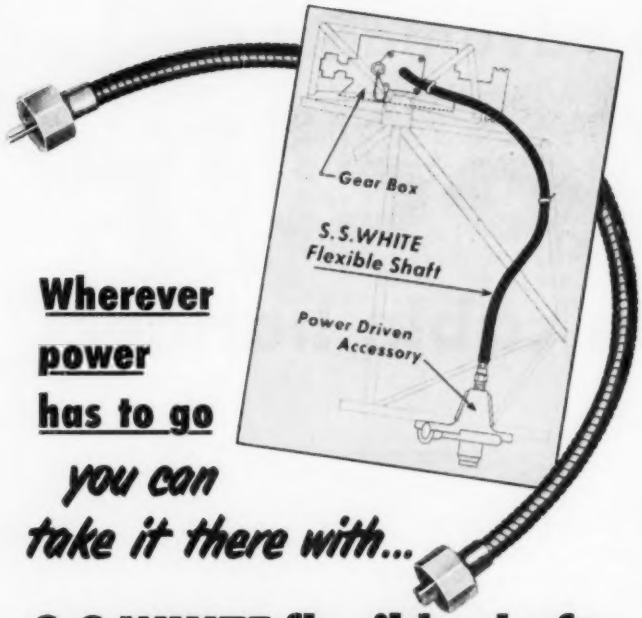

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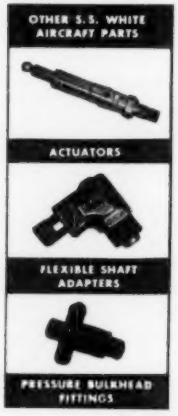

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only the lowest 30 kilometers of this picture could be studied by direct means, this being the greatest height to which instruments could be carried by balloons. But with the engineering triumphs of the V-2, Wac Corporal, Aerobee, and Viking rockets, it has been possible in the years since 1945 to extend direct measurements to as high as 390 kilometers. The rocket, in partnership with another product of engineering skill, the radio telemeter, has enabled the geophysicist to answer a number of important questions.

Rocket experiments have shown that the 350K and higher ozonosphere temperatures in the neighborhood of 50 kilometers obtained by indirect inference, although qualitatively in agreement with the facts, are too high by at least 60K. Densities between 60 and 100 kilometers obtained from meteor observations have been verified by direct measurement, and from 80 to 90 kilometers, a factor of 3 difference between upper air densities over Massachusetts and those over New Mexico is indicated.

The heights of ionospheric layers appear from rocket measurements to be appreciably lower than ground-based measurements had indicated. The air density on the order of 10^{-5} grams per cubic meter measured at 219 kilometers is far lower than presupposed, requiring considerable adjustment in thinking about the causes of the ionospheric layers. In rising above the light-absorbing regions in the atmosphere, it has been possible to observe solar radiation in various hitherto unobserved regions from the near ultraviolet into the X-ray portion of the spectrum. Such solar radiation studies are among the most fundamental for the upper air physicist, and it is to extend these and ionospheric and auroral observations that the rocket experimenter looks to the engineer for bigger and better rockets.

▶ "The High Altitude Sounding Rocket," by Milton W. Rosen and Richard B. Snodgrass, Naval Research Laboratory.

For many centuries man's conquest of vertical ascent proceeded slowly, limited by the heights of mountains and the altitudes attainable by air-supported vehicles. But in the last few years, sounding rockets have increased altitude records by a factor of ten, and they bid fair to produce a similar increase within the next decade.

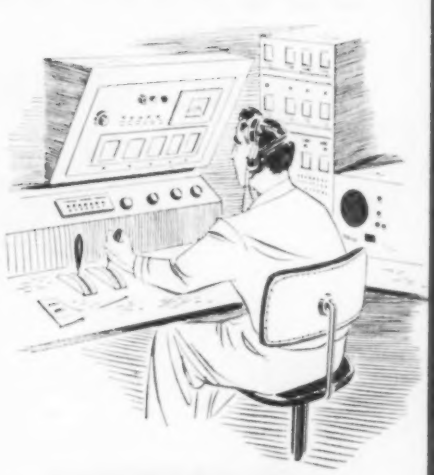
With the exception of the German V-2, high-altitude sounding rockets in use today are of American design. The Wac Corporal, Aerobee and Viking have transported seven tons of scientific instruments to altitudes between 40 and 140 miles. Twenty tons of instruments were carried to similar heights by V-2s during the course of a six-year program which is now terminating. New techniques for observing the flight performance of these rockets and for recovering information from the instruments they carry are in common use.

The sounding rocket is the immediate predecessor of the space vehicle—it is a significant step toward extra-terrestrial exploration.

▶ "Exposure Hazard from Cosmic Radiation at Extreme Altitudes and in Free Space," by Dr. Hermann J. Schaefer, U. S. Naval School of Aviation Medicine.

The high altitude recordings with rockets

Wear Control



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Combination Wind Cone and Wind Tee

CROUSE HINDS

AIRPORT LIGHTING

WIND TEES

Landing Direction

DAY and NIGHT

Crouse-Hinds Wind Tee serves as a continuous day and night indication of wind direction or preferred landing direction. It can be furnished either as a simple wind tee responsive to the wind only, or with accessories which make it completely automatic or controlled by a remote operator.

The wind tee gives the appearance of a single green "T" when viewed from above at night and a single stroke yellow "T" when viewed from above in the daytime.

1 **Standard Free Floating Wind Tee:** Responds only to flow of air. Constructed to meet CAA Specification L-808.

2 **Standard Free Floating Wind Tee with Position Indicating Transmitter:** Responds only to flow of air. Selsyn position indicator system shows true position of tee to operator in control tower.

3 **Wind Tee Complete with Automatic No-Wind Return and Position Indicating Transmitter:** Responds only to flow of air above predetermined low velocity (cutout velocity). The cutout velocity is adjustable between 5 and 15 mph. When wind drops below the cutout velocity, a motor automatically rotates the tee to the predetermined no-wind position (usually the preferred direction on the longest or preferred runway). The predetermined no-wind position is set mechanically in the base of the tee. The tee is held in the no-wind position until the wind velocity exceeds the cutout velocity when it again floats freely with the wind. The tee is complete with selsyn position indicating transmitter.

4 **Wind Tee with Operator Control and Selsyn Position Indicating Transmitter:** Tee responds to remote operator control when wind velocity is below cutout velocity. When wind exceeds the cutout velocity, motor is automatically disconnected from the circuit and the tee floats freely with the wind, preventing damage to the tee in strong winds. Tee is complete with selsyn position indicating transmitter.

5 **Combination Wind Cone and Wind Tee:** It is always desirable to have a wind cone in addition to a wind tee. The wind cone is extremely sensitive and indicates wind velocity and true wind direction at all times. The addition of the wind cone is particularly recommended for the operator controlled tee and the no-wind return tee. If the wind cone and wind tee are mounted adjacent to each other on the ground, the pilot's view of the tee is obstructed by the wind cone at certain angles. Where the wind cone is mounted on top of the wind tee, a pilot can quickly and easily determine the best landing direction and also the actual behavior of the wind.

Special Features: A flashing mechanism and controls can be added to the wind tee circuit to provide operation of the lights either steady burning or flashing. Red lights can be furnished in addition to the green lights on the wind tee, which is sometimes desired for traffic control.

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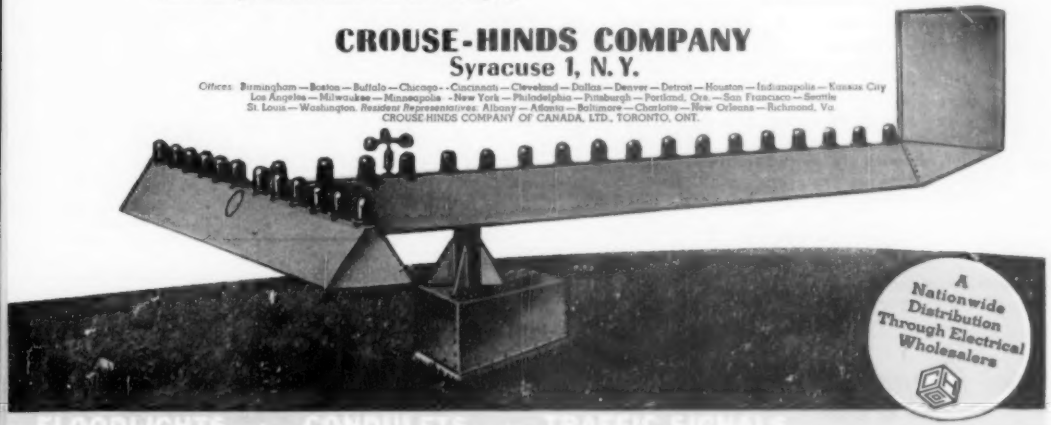

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and pilot balloons have brought about a revolutionary change in the concepts of the primary cosmic radiation. The interest of the radio-biologist is particularly focussed on the newly discovered phenomenon of the heavy nuclei rays. These rays exhibit some entirely novel features which cannot be produced by any natural or artificial terrestrial radiation source, and which are apt to endow them with a greatly increased biological effectiveness.

Of special importance is the extremely high rate of energy dissipation of the heavy nuclei. As a consequence of it the radiation dosage in a human organism exposed in the heavy nuclei region, which begins in the lower stratosphere, is not evenly distributed over the cellular tissue, but is condensed to "lines of destruction" in which the radiation dosage grows to excessive amounts whereas the surrounding tissue volumes stay unaffected. In the lower stratosphere the total human organism received about 100 such hits per hour.

An important consequence for the exposure hazard derives from the geomagnetic field. This field deflects the primary particles of cosmic radiation and thus exerts a shielding influence, strongest in the equatorial region and weakest in the polar cap.

For the region beyond the stratosphere and in free interplanetary space, no conclusive data as to the heavy nuclei intensities are available at present. The crucial problem is unsolved, namely, whether the apparent absence of low energy heavy primaries (the most harmful type for the living organism) is due to shielding influences of the earth's and sun's magnetic field, or whether these particles are already absent in the genuinely "primary" spectrum in interstellar space.

If the latter be true the consequences as to the radiation exposure of space ship crews can be expected to be not prohibitively serious. If, however, the genuinely primary spectrum extends in straight continuation to lower energies below the magnetic cut-off value, the radiation hazard in regions outside the shielded magnetic zones of heavenly bodies might become prohibitively large.

"The Satellite Vehicle," by Dr. Wernher von Braun, Redstone Arsenal, U. S. Army Ordnance Guided Missile Center.

With presently available chemical propellants it is possible to build a multi-stage rocket capable of carrying a crew and a substantial amount of payload into a satellite orbit around the earth. Booster stages of such a rocket can be salvaged and used repeatedly. The upper stage can perform a glide back to the surface of the earth.

With the help of such multi-stage rocket ships a permanent inhabited station can be established in the orbit.

Such a station would have enormous military and scientific utility. It could be used for a continuous photographic survey of both the heavens and the surface of the earth below. It would be the most valuable instrument for photo-reconnaissance behind the Iron Curtain. The station can also be used as a launching platform for orbit-to-ground guided missiles. It will not be an easy target to enemy countermeasures.

An orbital station would be an ideal jumping-off basis for trips further out into

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space and would bring voyages to the moon and the nearer planets into the realm of serious possibility.

The development of a satellite vehicle and its offspring, the space station, cannot possibly materialize as a mere by-product of present development programs in the field of guided missiles and supersonic airplanes. A coordinated "space program" is urgently necessary. Such a coordination program may be started on a modest scale, but ultimately the conquest of space and the establishment of "space superiority" will only succeed if an effort is made on the grand scale.

An energetic attack of this problem may lead to a new "ultimate weapon" capable of enforcing permanent world peace.

USAF CONTRACTS

Following is a list of recent USAF contracts announced by the Air Materiel Command.

Boots A/C Nut Corp., 50 John Street, Stamford, nuts, 900,000 ea. $50,975.

Bray Optical Co., 3445 W. First St., Los Angeles, camera, 200 ea. $29,540.

Breeze Corps., Inc., 41 S. Sixth St., Newark, N. J., hose clamps 400,000 ea., $61,600.

Bristol Mfg. Corp., Bristol, R. I., boots, 8,754 pr., $46,252.

Brown-Brockmeyer Co., 1000 Smithville Road, Dayton, grinder, drill, 225 ea., $92,279.

Brunner Mfg. Co., 1821 Broad St., Utica, portable air compressors, 157 ea., $59,236.

Buckeye Iron & Brass Works, 324 East Third St., Dayton 2, hydrant valve, 200 ea., $30,130.

Bulova Watch Co., 630 Fifth Ave., New York, indicators—controls, $500,000.

W. S. Burke Machine Tool, machine, milling, 164 ea., $162,360.

Burlington Mills Corp., Greensboro, N. C., tape, 3,207,000 yd., $62,502.

Camcar Screw & Mfg. Corp., 600 Eighteenth Ave., Rockford, Ill., bolts, 310,000 ea., $36,208.

Camel Mfg. Co., 329 South Central St., Knoxville, stabilizer covers, $47,188.

Canadian Commercial Corp., 70 Lyons St., Ottawa, trichlorethylene, technical type, 1,000,000 lb., $109,700.

Cannon Electric Co., 3209 Humboldt St., Los Angeles, connectors, $98,150; connectors, $116,067.

Cannon Mills Co., Kannapolis, N. C., cotton cloth, 118,100 yd., $39,669.

Carr-Fastener Co., div., United-Carr Fastener Corp., Cambridge, Mass., commercial hardware, $21,455.

John Chatillon & Sons, 89 Cliff St., New York, torque tester, 50 ea., $56,341.

Cincinnati Lathe & Tool Co., Oakley, Cincinnati, lathe, 9 ea., $38,936.

Cincinnati Milling & Grinding Mach. Inc., Cincinnati, milling machines, 10 ea., $113,-642; milling machines, 6 ea., $156,214; grinders, 89 ea., $692,338.

Clayton Mfg. Co., Ellis Lane & Valley Blvd., El Monte, Calif., dynamometer, 13 ea., $43,216.

Cleveland Pneumatic Tool Co., Cleveland, struts & spare parts, $203,086.

Clizbe Bros. Mfg. Co., W. Harrison St., Plymouth, Ind., pedestal type grinders, 157 ea., $50,609.

Collins Engineering Co., 9050 Washington Blvd., Culver City, Calif., bushing, connector, $25,069.

Collins Radio Co., 855-35th St. N.E., Cedar Rapids, high frequency transmitters, $55,794.

Collyer Insulated Wire Co., 249 Roosevelt Ave., Pawtucket, R. I., flexible cable, 131,-000 ft., $75,980.

Crescent Insulated Wire Co., Trenton, cable, $470,537.

Dial Screw Products Co., Inc., 32-21 58th St., Woodside, N. Y., tubular rivet, 68,260

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As more and more Men of Industry turn to time-saving air transportation, more and more planes are being comfort-converted with simple Vapor temperature controls.

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SUPER CONSTELLATIONS MAKE MONEY FOR AIRLINES

KLM Royal Dutch Airlines have just placed their *third* successive order for Super Constellations. Here is powerful indication of a famous airline's opinion of this larger, more luxurious successor to the experienced Constellation. KLM plans to put their Super Constellations into service on the heavily competitive North Atlantic route, where long range and superior performance are paramount.

Announced simultaneously was a new order for Super Constellations placed by Linea Aeropostal Venezolana. LAV also made their selection after careful consideration of the finest competitive equipment. This choice is backed by their long previous experience with dependable Constellations.

Why have a total of 12 world airlines ordered Super Constellations, bringing Lockheed's Constellation production line to the greatest peak in its continuous 8 year history?

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Here are some of the basic reasons why the Constellation has been reordered more often than any other modern airliner:

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2. The Super Constellation is versatile and can be easily changed in a few hours to carry as many as 94 passengers. Thus it can be used for many purposes on many routes to meet changing competitive conditions.

3. Airlines like its low operating cost. It is practical and reliable, and it makes money.

4. It has longer range than any other commercial airplane.

5. It can match in speed the competitive schedules of any airliner.

6. Operators like it because travelers like it—for dependability, luxury and speed.

Thus the Constellation and now the Super Constellation are currently playing a vital role in profitable airline operation, at the same time giving assurance of future profit because of the built-in "growth factor" not found in any other airplane.

lb., $67,153.

Dixon & Rippel Inc., Kingston, N. Y., brushes, wire, 14,000 ea., $34,380.

DoAll Cincinnati Co., Cincinnati, metal contour mach., 373 ea., $1,255,992.

Douglas Aircraft Co., Inc., Santa Monica, retrofit kits, $69,701; retrofit kits, 93 ea., $31,627.

Dow Corning Corp., Midland, Mich., insulation & sealing compound, 15,000 tubes, $36,300.

Dumont Aviation Assoc., 1401 Freeman Ave., Long Beach, Calif., bolt-aircraft, 605,000 ea., $27,713; nuts, 1,247,000 ea., $53,593.

Eastman Kodak Co., Rochester, N. Y., camera, $216,299; photographic film & paper, $157,633; photographic film & paper, $155,218.

Eclipse-Pioneer division, Bendix Aviation Corp., Teterboro, tubes, 20,374 ea., $213,315; starters, 228 ea. $884,823; starter, 164 ea., $37,861; components of automatic pilot, $468,973; electrical starters, 335 ea., $100,211; spare parts, $64,401.

Thomas A. Edison, 51 Lakeside Ave., West Orange, N. J., temperature indicator, 1,513 ea., $53,168.

Skyway Precision Tool Co., 1107 S. Fremont Ave., Alhambra, Calif., chamber assembly, 331 ea., 87,463.

Southwest Welding & Mfg. Co., 3201 W. Mission Rd., Alhambra, Calif., shipping containers, 41 ea., $50,608.

Standard Electrical Prod. Co., 2240 E. Third St., Dayton, relays, 861 ea., $52,892; exciter control relays, 487 ea., $40,017; condensers, 22,316 ea., $25,663.

J. P. Stevens & Co., Inc. 41 Leonard St., New York, cotton cloth, 108,700 yd., $164,474.

Superb Bronze & Iron Co., Inc., 3064-3088 Atlantic Ave., Brooklyn, N. Y., kit assembly, $81,411.

Superior Togs Corp., 32 7th St., Elizabeth, N. J., masks, 18,828 ea., $36,208.

Surety Rubber Co., Carrollton, Ohio, gloves, rubber, 45,156 pr., $49,879.

Sweebrock Aviation Co., 3105 N. Clinton St., Fort Wayne, dummy-parachute drop test, 182 ea., $27,846.

Switlik Parachute Co., Inc., 1315 East State St., Trenton, N. J., parachute, $35,468.

Technical Materiel Corp., 121 Spencer Place, Mamaroneck, N. Y., coupler-antenna, 580 ea., $71,880.

Thew Shovel Co., Hazel & Beech Sts., Elyria, Ohio, spare parts, $101,062.

Thompson Products, Inc., 23555 Euclid Ave., Cleveland, spare parts, 17 ea., $82,416.

Transport Products Corp., 3008 Magazine St., Louisville, overvoltage relays, 4,011 ea., $56,561.

Tucker Sno Cat Corp., Medford, Ore., spare parts, $162,430.

U. S. Electrical Tool Co., 1050 Findlay St., Cincinnati, grinders, 308 ea., $39,266.

United States Rubber Co., 1230 Ave. of the Americas, New York 20, grommet-elastic, $46,921.

Universal Moulded Products Corp., Commonwealth Ave., Bristol Va.—Tenn., table—folding, camp, 6,761 ea., $87,514.

Vapor Blast Mfg. Co., Milwaukee, blast cabinet, 48 ea., $73,680.

Varo Mfg. Co., Box 638 Garland, Tex., power units, 300 ea., $234,000.

Wal Thompson Hardware Co., Topeka, nails, $152,349.

Warner News, Inc., 625 Madison Ave., N. Y., prod. of motion picture project, $56,740.

Watervliet Tool Co., Inc., 1349 Broadway, Albany, N. Y., planishing irons, 180 ea., $35,820.

Waukesha Motors Corp., Waukesha, Wis., engine assy., 150 ea., $67,455.

Weatherhead Co., 300 E. 131st St. Cleveland, fitting assy., reducer, $31,081; container & cartridge assys., $49,700.

Western Brass Mills, 125 Mumson St., New Haven, Conn., tubes $181,494.

Wiedemann Machine Co., Philadelphia, punch turret, 6 ea., $56,746.

William, Brown, & Earle, Inc., 918 Chestnut St., Philadelphia, misc. photo items, $39,312.

Franklin C. Wolfe Co., Inc., 3644 Eastham Dr., Culver City, Calif., fuel seal washers, $346,747.

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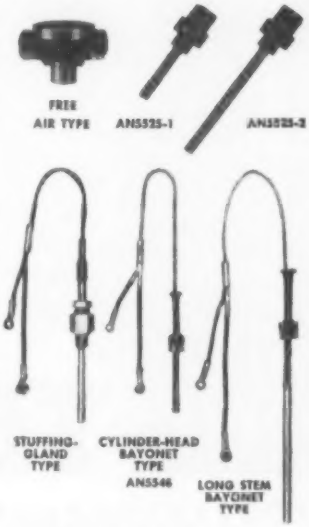

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Cylinder-head Bayonet Type has probe dimensions similar to the familiar bayonet thermocouple and is used with same AN4076 fitting. Sensitive silver tipped element and sturdy spring insure fast, accurate temperature indication.

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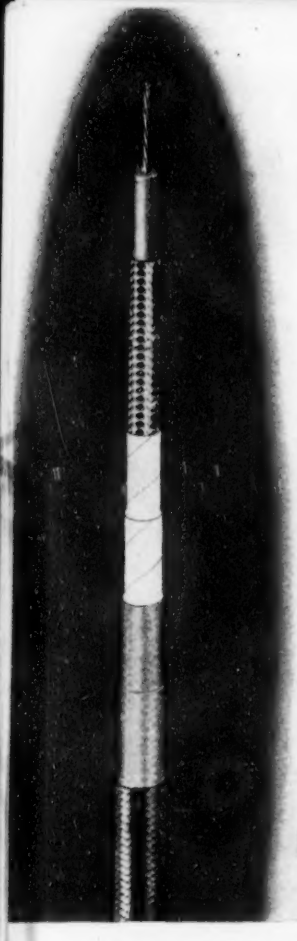

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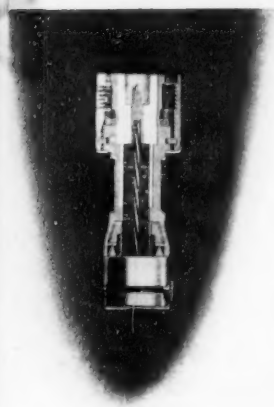

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AMPHENOL

Vogue-Wright Studios, 462 E. Ohio St., Chicago 11, production of motion picture, release prints, $63,336.

Ypsilanti Mach. & Tool Co., 103 Grove Street, Ypsilanti, Mich., ladder assy., 2,478 ea., $35,144.

Zenith Carburetor div., Bendix Aviation Corp, 696 Hart Ave., Detroit 14, maintenance parts, 14 items, $31,645.

Bethlehem Steel Co., Bethlehem, Pa., wire cable, $53,670.

Blick Mfg. Co. Ltd., 2601 Madison St., Kansas City, Mo., cover assembly, 2,691 ea., $80,082.

Boyt Harness Co., 303 New York Ave., Des Moines, safety belt, 19,428 ea.; safety belt, 6,676 ea., $189,727.

Bray Studios, 729 Seventh Ave., New York, production of a motion picture, script, release prints, $29,238.

Brunswick Aircraft Supply, Inc., 1771 N. San Fernando Blvd., Burbank, Calif., crankshaft assemblies, $325,012.

Buckeye Iron & Brass Works, P. O. Box 883, Dayton, nozzle, 2,120 ea.; nozzle, 1,314 ea., $91,700.

Cal-Textile Mfg. Co., Asheville, N. C., shelter, type B-2A, 280 ea.; shelter, type B-3, 219 ea., $975,100.

Camel Mfg. Co., 329 S. Central St., Knoxville, cover assembly, 3,350 ea., $46,702.

Cardox Research Co., 5426 San Fernando Rd., Glendale, Calif., patching sealant, 1,500 pt.; sealing compound, 16,000 pt., $34,870.

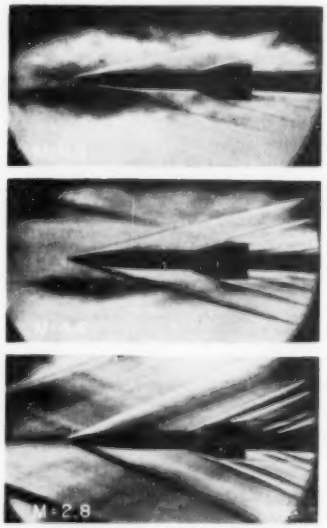
Chicago Aerial Survey Co., 332 S. Michigan Ave., Chicago, printer, 250 ea., $35,760.

Coast Paint & Chemical Co., 1507 Grande Vista Ave., Los Angeles, fuel tank sealant, 13,334 pt.; patching sealant, 17,500 bottles, $116,542.

Commercial Filter Corp., 18 W. Third St., Boston, oil filter elements, 41,040 ea., $38,824.

Communications Co., Inc., 300 Greco Ave., Coral Gables, Fla., control conversion unit, $618,819.

Continental Electronics Ltd., 302 Oakland St., Brooklyn, transformer assembly, 6,000 ea., $42,900; connector plugs, 5 ea., $64,074.



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Flow patterns from supersonic to hypersonic speed are seen by the reflecting eyes of the schlieren apparatus in NACA's 10x14-in. supersonic wind tunnel at Ames Aeronautical Laboratory, Moffett Field, Calif. Model missile is apparently of German V-2 geometry.

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FINANCIAL

S & W Common Goes on N. Y. Curb

Listing of stock on major exchange indicates carrier's financial maturity; 582,581 shares now outstanding.

A measure of major financial acceptance has been accorded Seaboard & Western Airlines, Inc., with the listing of that carrier's common stock on the New York Curb Exchange. A few months earlier, the common stock of the Flying Tiger Line, Inc., went into the same exchange.

These listings provide a broader market for securities and, in a sense, represent an endorsement of the financial maturity of the companies involved.

▶**S&W Background**—Now that its stock is listed on a national stock exchange, it is interesting to review the historical growth and record of accomplishment of Seaboard & Western.

Since the company was organized Sept. 12, 1946, with a capital of $100,000, which included a war-surplus DC-4, it has shown a phenomenal growth in revenues and finances.

At June 30, 1952, the total net worth position aggregated almost $1,900,000. The records indicate that from July 1, 1949 to June 30, 1952, $316,610 of the net worth was obtained by the sale of additional stock, largely through the exercise of options at various times at prices averaging around $1.00 per share. (The current market is around $10 per share.)

Giving effect to a 25% stock dividend paid Apr. 30, 1951, there are 582,581 shares of common stock outstanding. (On this basis a book value of $3.20 per share is indicated.) In addition, the two principal officers of the company hold options on a total of 62,500 shares at $3.40 per share up to Feb. 15, 1960.

To help finance its growing requirements the company has borrowed $920,000 as of July 7, 1952, under its bank letter of credit which now has a maximum limit of $1,400,000. This loan is secured by the company's aircraft.

▶**New Financing**—Proposed new financing is also being currently revealed. As previously announced, the company has ordered four new Lockheed 1049B Super-Constellation freighters which are scheduled for delivery early in 1954. To help finance this, the company plans to arrange for a bank loan of about $5 million to be secured by a pledge of all flight equipment, including the new planes to be acquired.

In addition, it now appears that an issue of approximately $2,500,000 in convertible debentures, subordinate to the bank loan, may be offered later in 1952. This is similar to the debt financing program pursued by the Flying Tigers (AVIATION WEEK, Aug. 11).

The purchase price of the aircraft and spare parts will approximate $7,600,000, of which $145,000 has been paid, $160,000 was due on or before Aug. 10, 1952, and $1,184,450 on Sept. 15, 1952. The balance of the purchase price is payable upon delivery of the aircraft and spare parts.

As of July 9, 1952, Seaboard & Western was operating eight C-54s. Five of these planes were owned by the company and three were on lease from the U. S. Government.

Total capital commitments for Seaboard & Western aggregated $8,250,000 at the 1951 year-end and include

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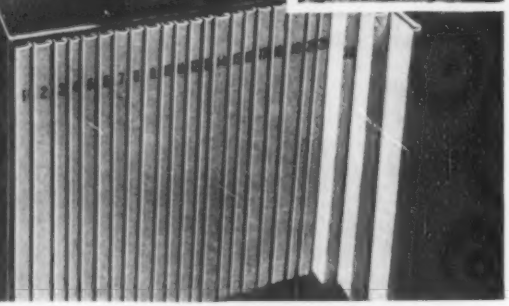

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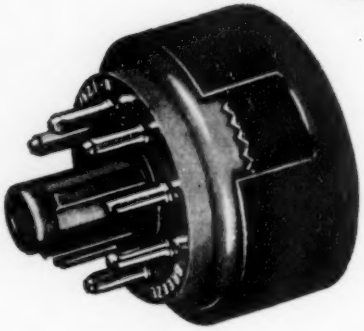

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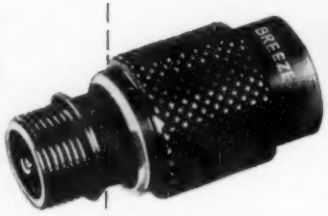

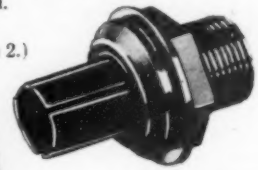

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the purchase order for the four Super-Constellations. Cash requirements to meet these obligations will total $2,500,000 for 1952.

▶ **Intensive Utilization**—The company has demonstrated a remarkably intensive utilization of its working funds. At Dec. 31, 1951 it showed an excess of current liabilities over current assets of $329,158. By June 30, 1952, the negative working capital position was reversed to show an excess of current assets over current liabilities of $142,164. The company reported that it had no past due accounts payable and has fulfilled its working capital requirements under its bank loan agreement. Moreover, further funds were available to it under this credit arrangement.

Underlying Seaboard & Western's financial development, are the substantial gains in its scope of operations. Available records show that for the year ended Aug. 31, 1948, a total of 1,551,094 plane miles and 4,057,987 freight ton miles were flown. This had increased to 6,717,391 plane miles and 6,365,379 freight ton miles for the year ended Dec. 31, 1951.

Revenues and earnings have matched this growth. For the year ended Aug. 31, 1948, total gross revenues aggregated $2,305,921. The contrast is striking when compared with the $10,784,342 shown for the year ended Dec. 31, 1951. Net income has followed this same course. From a net profit after taxes of $11,572 for the year ended Aug. 31, 1948, a total of $518,015 was reported for the 1951 calendar year. This latter period excluded a net capital gain of $184,921 from the sale of aircraft.

For the six months ended June 30, 1952, Seaboard & Western total revenues aggregated $5,941,060 and after operating expenses amounted to a net before taxes of $647,094. After taxes, net income amounted to $272,977.

This latter period excluded a $410,700 net capital gain from aircraft sales.

▶ **Certificate Battle**—Significantly, of the company's 1951 total revenues, about 74% came from the Pacific airlift. For the five months ended May 31, 1952, this ratio was around 68%. This is a manifestation of the ingenuity pursued by the company in developing revenues. Its basic activity, of course, is centered in international air cargo operations in the North Atlantic field. The company disclaims any plans for expanding its activities to domestic and overseas passenger and freight.

S&W has been operating under a CAB letter of registration as a large irregular carrier. Its dispassionate account of the governing regulator processes hardly indicates the extenuating and frequently bitter circumstances surrounding these proceedings.

Seaboard & Western's key application was filed July 17, 1947, for a certificate of public convenience and necessity for the transportation of property only between the U. S. and areas in Europe and the Near East.

In a matter-of-fact manner, the company reports: "By decision of the Board rendered Feb. 9, 1951, approved by the President . . . May 10, 1952, said application was denied in all respects.

"By order dated June 24, 1952 and approved by the President . . . June 26, 1952, the Board found: 'that there may have been significant developments in respect of trans-Atlantic cargo service since the evidentiary hearing in this proceeding, evidence of which could be presented in a reopened proceeding and that if established by the applicants the public convenience and necessity might be found now to require the certification of one or both of the applicants, with a corresponding modification of the Board's decision herein.'

"Accordingly, the Board reopened the said certificate proceeding for rehearing and reconsideration and the same is now pending and undetermined before it."

This simple recital does not begin to reflect the drama and tension that has gone before and which is likely to follow before this basic issue is resolved.

—Selig Altschul

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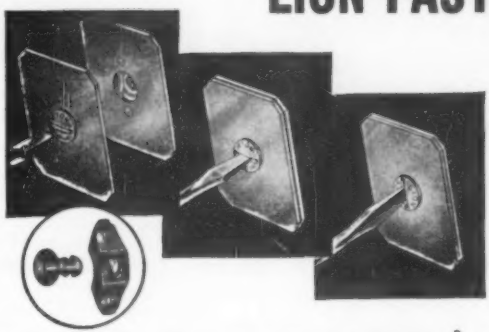

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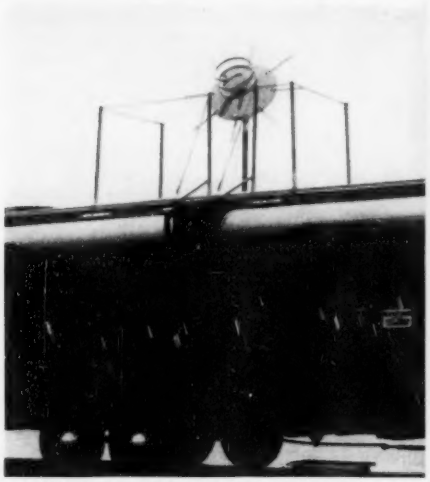

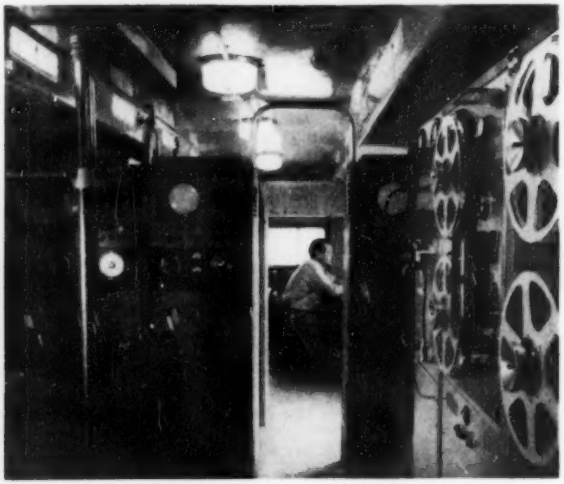

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'Little Black Boxes' Move In on Pilots

- **Western Electronic Show hears about avionic advances in telemetering devices, transistors, computers.**
- **But shortages of engineers may slow future progress, meeting hears; Canadian money lures some.**

By William J. Coughlin

Long Beach, Calif.—The emphasis was on telemetering, transistors, and electronic computers, as more than 10,000 engineers, physicists, and technicians turned out for the recent three-day Western Electronic Show here.

The large attendance seemed to support claims by California engineers that the avionics industry is growing twice as fast in the West as it is in the rest of the nation.

The majority of 200 exhibits and most of the papers presented during the 29 convention sessions involved products or subjects either directly or indirectly connected with aviation. TV and audio equipment took a back seat with many of the visitors coming from nearby airframe or avionics manufacturers.

The convention was jointly sponsored by the Institute of Radio Engineers and the West Coast Electronic Manufacturers' Assn.

▶**A Pilot's Reactions**—To a pilot walking through the exhibit hall and attending the IRE seminars, a no-longer-new fact became increasingly clear: The day was fast approaching when he would become excess baggage. The "little black boxes" were closing in on him.

Exhibits such as that of Hoffman Radio Company's new lightweight "Gibson Girl" emergency transmitter were reassuring evidence that the pilot was not yet extinct. But one look at the electronic computers on display was enough to set him shaking in his flight boots.

▶**Shortage of Engineers**—It came as no surprise that the shortage of engineers is getting worse, not better. R. L. Sink, IRE regional director and chief electrical engineer of Consolidated Engrg. Corp. summed it up this way: "There exists today an overwhelming need for well-trained, brilliant young engineers who will carry the load of the growing industry. There appears to be an ever increasing shortage of such men which may eventually result in a tragic shortage of badly needed weapons for defense."

The never-modest California Chamber of Commerce credits the rapid growth of the avionics industry in the West to the fact that many engineers are migrating in this direction in order to take advantage of the state's sunshine.

But one trend which surprised some engineers at the Long Beach convention appeared to parallel a similar development in pro football: Several prominent faces were missing, lured north of the U.S. border by high-salaried raids of the likewise rapidly expanding Canadian avionics industry. It took no electronic computer to figure out that green money can outdraw yellow sunshine almost everytime.

▶**Award to Pettit**—The IRE Electronic Achievement Award for the Pacific region was presented to Dr. Joseph M. Pettit of the Stanford Research Institute. The award was made to Pettit, who was prominent in radar countermeasures during the war, for his contributions to electronics research and invention.

▶**Spotlight on Telemetering**—The growing importance and use of telemetering systems to transmit data from aircraft and guided missiles was evidenced by many technical papers delivered on the subject. To cite an example:

• **Monitoring flight tests** of new experimental aircraft is possible with a new Douglas Aircraft Co. telemetering system. Floyd E. Bryan of Douglas described the system which permits Douglas engineers on the ground to advise a test pilot at once how various maneuvers he is executing are affecting the airplane. The system also includes

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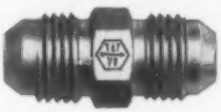

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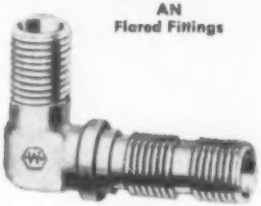

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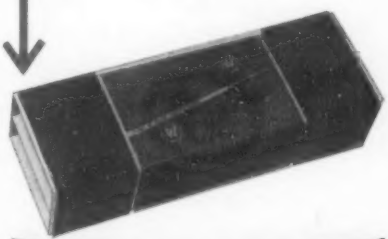

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CIRCUIT RIDER (Vol. 6, No. 2, published by Electrical Construction and Maintenance)

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CHEMICAL WEEK (Jan. 26, 1952)

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• **Microwave digital telemetering** system using pulse-time modulation and which incorporates a null-balancing servo system to convert analogue data to digital form was described by C. A. Piper of Bendix Aviation. Intelligence is transmitted as coded beacon responses at radar repetition rates and is received by microwave tracking radar on the ground. After temporary storage and checking for false-code groups, the information is printed to three significant decimal digits on an automatic electric typewriter at the rate of 15 characters per second.

• **Digital recording system** for telemetered data which uses a pulse-width modulated system to modulate a 500 kc. carrier at the receiving station was described by D. J. Simmons of the Naval Ordnance Test Station at Inyokern. The number of sine waves in each pulse of the 500 kc. carrier is then counted electronically, and these counts are recorded by means of neon glow tubes in a moving film camera.

• **An FM/FM telemetering** system compatible with standards established by the Research and Development Board was described by R. E. Collander of Bendix Aviation—Pacific division. He told how the nominal maximum data transmission capacity could be exceeded under certain conditions without sacrificing data transmission accuracy.

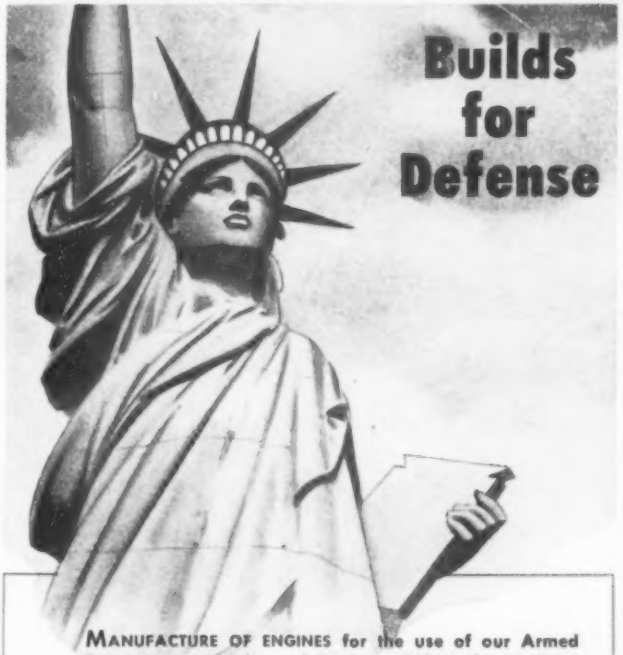
▶ **Telemetering Transducers**—The transducers which convert desired intelligence into electric signals for use in telemetering also came under discussion at the meeting.

• **Vibrating wire transducers,** relatively new to the telemetering field, were described by Robert W. Poindexter of the Byron Jackson Co. The device can be used to measure any quantity which can be converted into a small linear displacement and applied to the end of a vibrating wire. The system includes the pick-up containing a small stressed wire vibrating at its natural frequency and a separate feedback amplifier.

Changes in the variable under measurement cause a change in the frequency of the amplifier's a.c. output. Poindexter said the transducer system output frequency, and hence its accuracy, is unaffected by changes in the amplifier characteristics and that the system has high frequency response and low hysteresis.

• **Rate gyro characteristics** needed to measure angular rates of missiles in flight, yet capable of withstanding extreme shock and temperatures were described by Harry M. Steele, Jr., of Instrument Associates of California. He cited the advantages of using floated-type rate gyros, with torsional rate

CONTINENTAL



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springs, viscous damping, and a high natural frequency.

• **Transducer size** can be reduced and output voltage can be increased using a new development in unbonded strain gage technique, Bernard B. Helfand of Statham Labs told his audience. He showed them a pressure transducer only ¼ in. in diameter, and an accelerometer pick-up with an output of more than one volt.

► **Transistors**—Visitors who flocked to the transistor sessions heard speakers describe:

• **More efficient junction-type** germanium rectifiers and transistors, principally of the p-n-p type, developed by General Electric. John S. Saby said that GE has devised a method for artificially creating p-n junctions by diffusion of donar and acceptor type impurities into a single crystal semi-conductor. The result is a high-gain, low-noise semi-conductor with good stability at high power levels, Saby said. The new devices can be enclosed in a plastic bead of less than ¼ in. diameter.

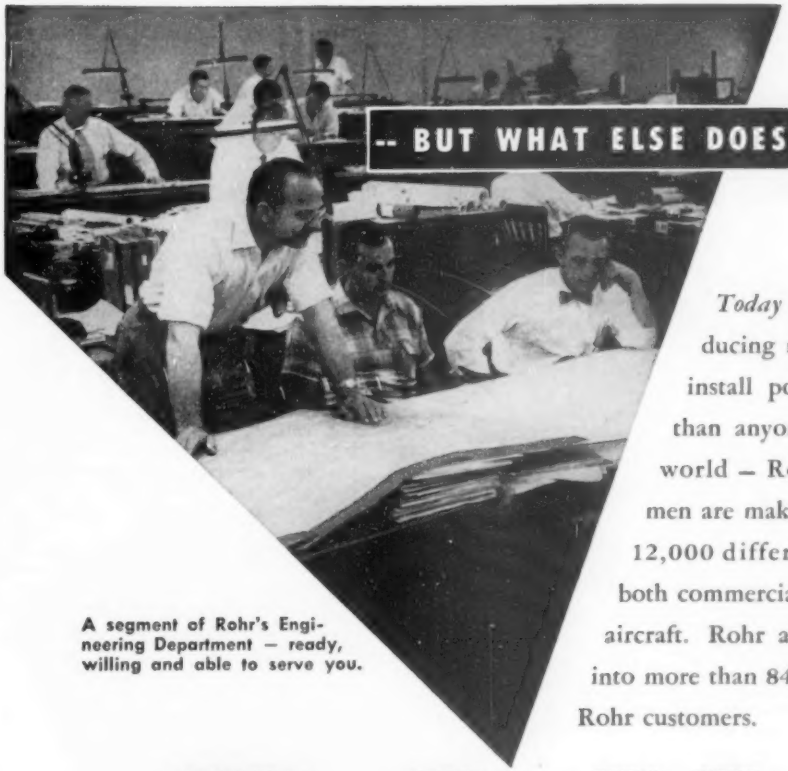
• **Photocell transistor** of the p-n junction type which has a sensitivity of 30 ma. per lumen for light of 2,400 deg. K. color temperature. J. N. Shive of Bell Telephone Labs described the new photocell transistor which he said has a frequency response flat into the 100 kc. region and which is encased in a plastic housing ¼ x 5/16 x ¾ in.

• **Transistor pulse circuits** in which pulse rise times of 0.1 microsecond are easily obtainable with a supply voltage of 10 to 45 volts. A. E. Anderson, also of Bell Labs, said that pulse rise times of 0.02 microsecond have been obtained at 6 volts. In these circuits, output impedance is low (about 50 ohms), and the circuits are very insensitive to stray wiring capacitance, according to Anderson.

► **Converters and Computers**—Devices to convert analogue-type data into digital form for use in digital computers came in for more discussion than the computers themselves. Some of the devices described were:

• **SADIC**, a device for converting low-level analogue voltages (from strain gages or thermocouples) into equivalent three-decimal digital data. The paper by R. L. Sink and G. M. Slocomb of Consolidated Engrg. Corp. described the use of self-balancing potentiometers with 1,000 discrete balance positions which provide an output in the form of contacts suitable for operating tabulating equipment, tape, punch cards, or for direct connection to a digital computer. Accuracy and stability was reported to be within 0.1%.

• **Spaced-pulse converter** in which the number of pulses is a digital representation of the displacement of the analogue data input shaft from zero. The converter was described by G. W. Lund of



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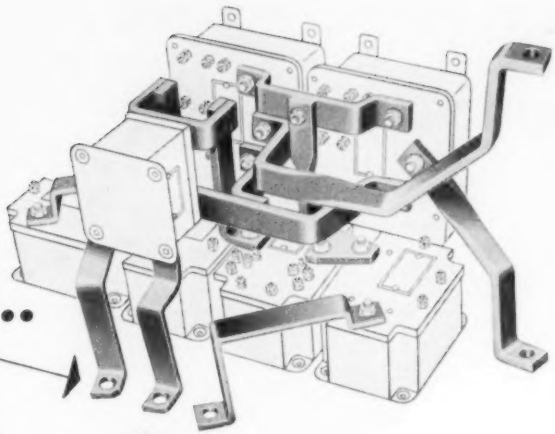
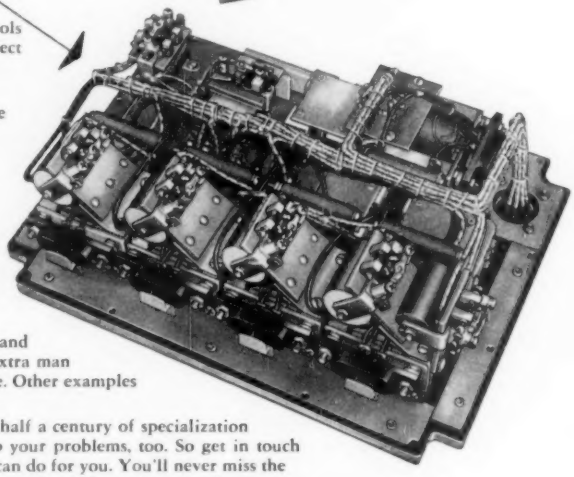


Hartman *Unitized* Controls — multiple controls centralized in one compact package — effect significant economies in space, wiring, assembly time, and weight.

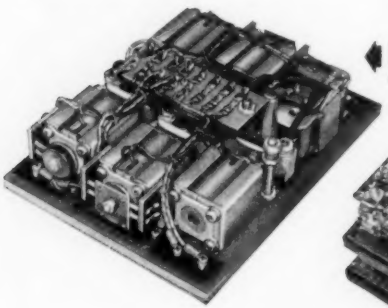
For example, a large manufacturer, faced with the difficulty of installing 7 separate control units with 28 mounting screws, and interconnecting the controls with 10 heavy bus bars and 18 lead wires *(above)*, turned the problem over to Hartman engineers for analysis.

Result? Hartman designed a single, easy-to-install *Unitized* control *(at right)*. This design cut the number of buses from 10 to 4, the control terminals from 18 to a single AN connector with eight pins.



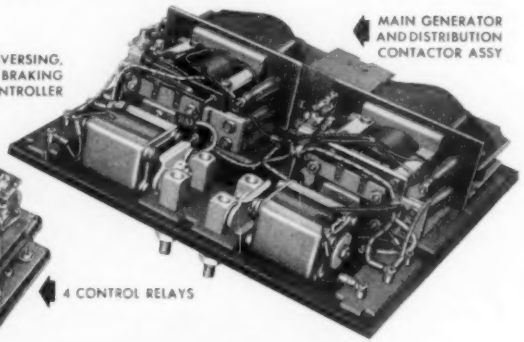
Gone is the extra cubage . . . the extra weight and complexity of a complicated bus system . . . the extra man hours of installation, assembly and inspection time. Other examples of Hartman *Unitized* Controls are shown below.

Typical of the smooth efficiency that comes from half a century of specialization in controls, Hartman engineers are ready to whip your problems, too. So get in touch with Hartman now to see what *Unitized* Controls can do for you. You'll never miss the bus you're now installing—and you'll save space, weight, and precious man hours.



3-SPEED, REVERSING, DYNAMIC - BRAKING MOTOR CONTROLLER

4 CONTROL RELAYS



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• **Highspeed outscriber** to record the output of a digital computer. The device, as described by W. H. Ware of Rand Corp. uses a moving stylus and voltage-sensitive teledeltos paper to print up to 80,000 bits per minute in binary form.

► **Miscellany**—Some of the other papers of avionics interest discussed:

• **Increased tube life:** By reducing vacuum tube filament voltage from 6.3 to 3 volts, a designer can increase tube gain by 50%, lengthen tube life, cut filament power supply requirements, reduce heat dissipation problems, and cut d.c. drift, Arthur J. Winter of Telecomputing Corp. told his audience. He presented analytical and experimental data to show the effects of reduced filament voltage on various tube characteristics.

• **More efficient power supply:** The use of vacuum tubes to reduce the output impedance of power supplies which use magnetic amplifier regulators will improve the unit's efficiency, John E. Richardson of Hughes Aircraft said. Some power supply efficiencies run as low as 30%, he said. Richardson described the technique which he said would double efficiency at no increase in size and only slight weight penalty.

• **Homodyne detection:** A new microwave technique, called Homodyne detection, in which the amplitude modulation of the carrier is changed by shifting the phase of the carrier rather than that of the sidebands was described by Frank L. Vernon of Hughes Aircraft Co. Use of this technique, he said, permits measurement of phase to an accuracy of ±4 deg. or better.

• **Automatic cruise control:** The need for automatic cruise control to improve fuel economy and thereby increase the range of long-range aircraft was cited by J. R. Shull of the J. B. Rea Co. He then described a computer which would do the needed job.

• **Refrigeration for avionics:** The use of germanium diodes and transistors might reverse the recent trend toward use of high temperature avionics components and air cooling, D. T. Drake of North American Aviation predicted. With semi-conductors presently limited to operation in ambient temperatures under 70C, their use in avionics equipment may force designers to use refrigeration. Drake suggested mounting avionics components on a plate through which the refrigerant or coolant would be passed.

• **Phase shift servo system:** A servo system which uses phase-shifting capacitors instead of synchros or potentiometers to transmit angular position data and in which the error signal is obtained by comparing the phase rather than the magnitude of the capacitor voltages,

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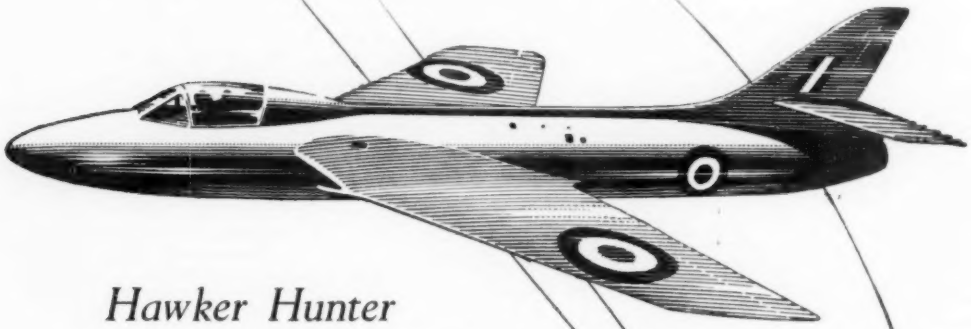

Hawker Hunter

. . . world's finest fighter aircraft

A great production effort is now being launched at Hawker Siddeley Group to speed into squadron service with the R.A.F. the graceful Hawker Hunter, world's finest fighter aircraft. Besides a maximum drive at Hawker's Kingston factory, an entirely new plant at Squire's Gate, Blackpool is also to build this super priority day interceptor. Extensive sub-contracting throughout the Group will also speed the day when Hunter squadrons fly over Britain's skies.

Such co-operation between member companies is typical of the smooth integration of Hawker Siddeley Group's organisation. Largest of its kind in the world, this great industrial commonwealth now employs its mighty resources, by day and night, in building the defensive strength of the Free World.

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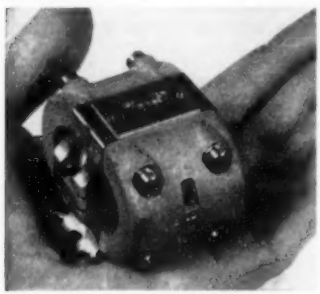
was described by A. F. Bowen of the Navy Electronics Lab. Among the advantages cited by Bowen for the system were: low inertia, small frictional torque, good static and dynamic accuracy, low noise level, and the absence of rate components in the error signal.

FILTER CENTER

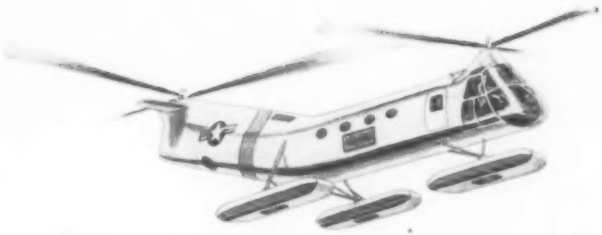
▶ **Call Me Madam**—The electronic computer industry's wordsmiths must have been working overtime to find suitable names for the rash of new "brains" announced in recent months. The job isn't easy. Each word in the formal name must be so placed in the group that its initials can be combined to form a nickname. Added complication is the need for vowels to make the nickname pronounceable. The RAYDAC, for instance, is the new Raytheon Digital Automatic Computer. The Applied Science Corp. of Princeton has hit the jackpot with its Multipurpose Automatic Data Analysis Machine, called MADAM for short.

▶ **B-66 To Get M-H Autopilot**—Minneapolis Honeywell's new E-11 automatic pilot has been selected for use on the USAF RB-66 and B-66 medium bomber version of Navy's A3D. The E-11 is a lighter, improved version of M-H type E-6 autopilot. AF decision to buy E-11 rather than standardize on Sperry A-12 planned for Navy A3D may have been influenced by Sperry's current heavy factory load. E-11 order is reported to be about $4 million. M-H also recently received an AF order for $12 million worth of E-6 autopilot spare parts and tools.

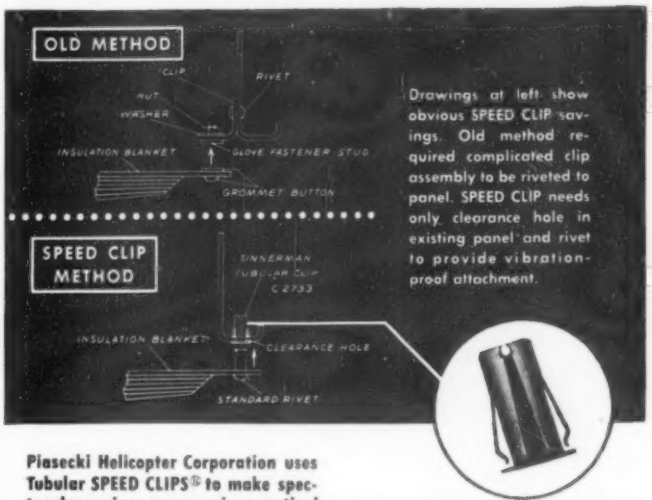


MIDGET MOTOR

Small, powerful torque motor for operating hydraulic servo-valves to control hydraulic flow has been announced by Midwestern Geophysical Lab of Tulsa, Okla. Device converts small electrical signals into low-amplitude linear displacements. The Model 9 shown has a midposition force of 9½ lb., stroke of ±0.015 in., natural frequency of 425 cps., and weighs 19 oz., Midwestern says.



"Flying Workhorse" picks up
71% assembly savings . . . 73% weight savings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TINNERMAN TUBULAR CLIP C 2733
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Drawings at left show obvious SPEED CLIP savings. Old method required complicated clip assembly to be riveted to panel. SPEED CLIP needs only clearance hole in existing panel and rivet to provide vibration-proof attachment.

Piasecki Helicopter Corporation uses Tubular SPEED CLIPS® to make spectacular savings over previous method of attaching blanket insulation.

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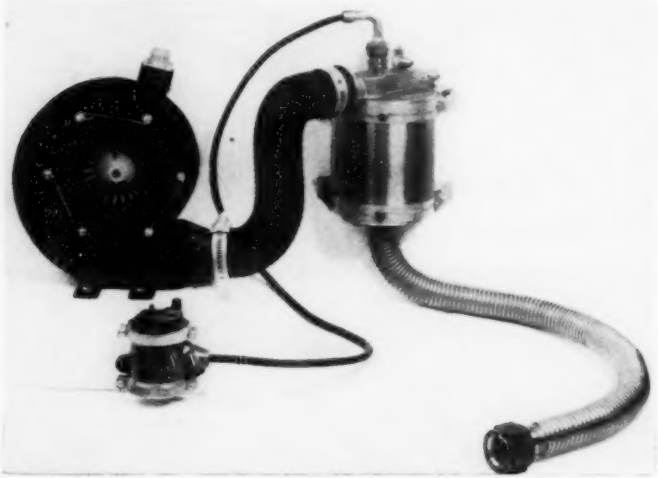


THIS GASIFIER (shiny cylinder, center) started aircraft piston engine in 40 sec. after powerplant had been kept at −65F for more than 24 hr. in cold test.

Altitude Boost Claimed for Device

Higher jet combustion efficiencies are possible when Gasifier changes vaporized fuel to superheated gas.

By Scott H. Reiniger

The prediction that a device called a "Gasifier" can add 10,000 ft. to the fighting altitude of our military aircraft has been made to AVIATION WEEK by Robert Reichelm Co., Stratford, Conn.

The unit can do this, the company asserts, by raising combustion efficiencies to a point much higher than heretofore obtainable in jet engines, permitting better mixing and more stable fuel air ratios at high altitudes.

Robert Reichelm, president, states the system is proven and can be quickly installed in any military jet engine without requiring major design modifications.

▶ **Process Feasible**—Fuel experts in leading oil firms interviewed by AVIATION WEEK and aeronautical engineers say Reichelm's claims are feasible. This is no "Johnny-come-lately" development, the inventor says, but a product in the making for the past 15 years, with several side products which already have reached the market, including a new, highly efficient burner for industrial furnaces.

This reporter studied a 1947 report by a government agency that showed an early model of the Gasifier cut carbon deposits in a J33 jet engine combustor from 25 to 50%. Important fuel savings also are claimed by Reichelm.

▶ **Gaseous Fuel**—The Gasifier gives aircraft a big lift by introducing a gaseous, rather than vaporized, fuel into the igniter, the firm explains. Before fuel reaches the main combustion area for mixing with air and ignition, it is given a "preliminary mix" with bled air and run through a gauntlet of flame (caused by burning a small part of its own fuel by a special spark) to bring it from the fuel-air vapor stage to a superheated fixed gas, the company claims.

▶ **Low-Pressure Delivery**—The system is described as a low-pressure type—as against costly and more complicated high-pressure fuel delivery systems commonly used. Some of these operate at pressures up to 1,000 psi.

Reichelm thinks he may have a hard row to hoe in getting acceptance of his system—because of heavy commitments already made in engineering and production of present systems—but he believes it, or something like it, must be adopted if altitude performance is to be increased measurably in jets at the present time.

The alternative, as he sees it, is a vicious circle of higher and higher delivery pressures necessitating more complicated equipment to obtain finer and finer vaporization at the nozzle with not much increase in performance. In contrast, he stresses that his system is relatively low cost, weighs only a few pounds, and involves only a few parts.

A low-pressure system is in use, in the British Sapphire jet engine produced by Wright Aeronautical Corp., but that is not similar to his, Reichelm says.

▶ **Army Starter**—The Army is grooming a small piston-engine version of the Gasifier for Arctic starting of auto engines, Reichelm says. In a joint release with the company, Army states it "seems to be an answer to the Army's prayer for something to combat cold weather. . . ." The unit was tested at Ft. Belvoir, Va.

Army says it starts engines "in less than 30 sec. in temperature as low as −65F." And this is without any external preheating. Ability to turn engines for starting depends on methods of cranking, oil system and lubricants, studies of which ". . . have long been underway," it discloses.

Another Gasifier model started a high-powered aircraft piston engine in 40 sec., though the engine had been kept on ice at −65F in simulated Arctic conditions for more than a day, Reichelm relates. It would take up to an hour to start by conventional means, he claims.

The system used for aircraft piston engines has a special blower to supply air to the fuel in the Gasifier. The Army unit depends on suction in the intake manifold. None look like the jet engine version which Reichelm is not at liberty to show.

▶ **Starter Operation**—Fuel is bled off the main line to the carburetor, routed to the Gasifier, which mixes it with air and ignites it. The system takes the place of the primer, can run the engine as long as required for normal carburetion to take over. It is actuated by a priming switch which sends current to an ignition coil to operate a sparkplug in the Gasifier and a solenoid valve to allow passage of fuel to the same unit.

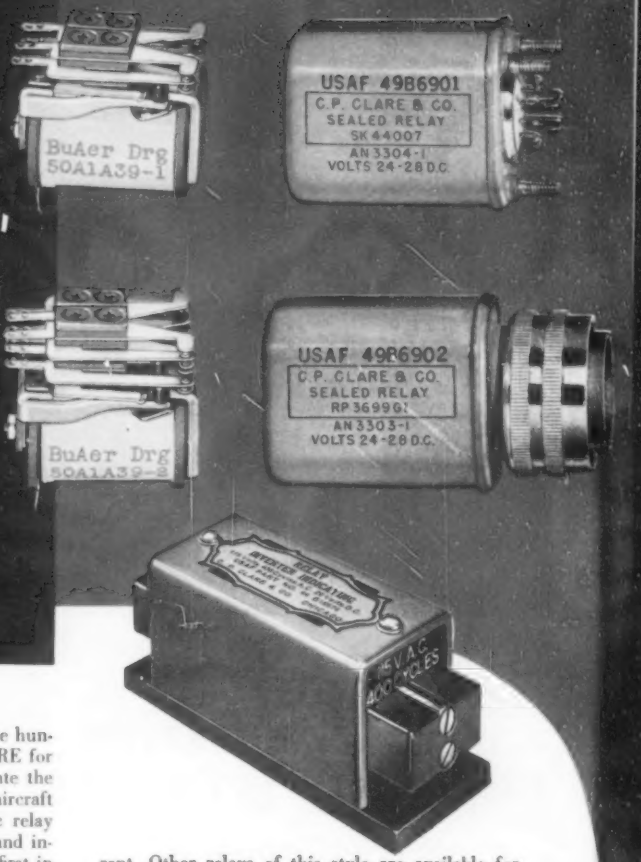
Only a small portion of the fuel is burned in the combustion zone of the Gasifier. The major part passes through the flame over baffle plates and is discharged as a superheated gas into the induction system of the engine, at an outlet below the carburetor mounting pad. Damage by overheating the induction lines is avoided since the hot gas is considerably modified by mixing with cool fuel-air mixture coming from the carburetor throat in the normal manner.

The Gasifier system is deceptively simple in appearance—its operation de-

CLARE RELAYS

"Custom-Built"

for AIRBORNE EQUIPMENT



PICTURED on this page are just a few of the hundreds of relays "custom-built" by CLARE for military and civil aircraft use. They illustrate the adaptability to the diversified needs of the aircraft industry and the military services of basic relay designs and high standards of engineering and inspection which have made CLARE Relays "first in the industrial field."

Four of the five relays shown are variations of the same basic relay structure—the CLARE Type "R"—which is characterized by unusual sensitivity and extremely long life. It is an ideal combination of the very real advantages of a telephone-type relay with the small size, light weight and high resistance to vibration needed to meet the rigid requirements of aircraft service. It is but one of a number of basic relay types available to aircraft designers.

Of an entirely different type is the Inverter Failure Indicating Relay (shown at the bottom). This is one of a number of CLARE Type "400" Relays especially designed for aircraft powered with 400 cycle current. Other relays of this style are available for operation on 380 to 1000 cycles. The proven dependability of these CLARE relays has made CLARE the country's chief source of 400 cycle relays.

CLARE pioneered the manufacture of hermetically sealed relays for aircraft service and is still the leader in this field. Fifty and more different series of CLARE hermetically sealed relays are now available, with innumerable variations of coil and contact specifications possible within each series.

For full information on CLARE relays for aircraft, address C. P. Clare & Co., 4719 West Sunnyside Avenue, Chicago 30, Illinois. In Canada: Canadian Line Materials Ltd., Toronto 12. Cable Address: CLARELAY.

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THIS PRODUCTION LINE SCENE in the North American Aviation plant at Los Angeles shows Thermoflex* Insulation Blankets being applied to tail pipes of North American Sabre Jets on order for the United States Air Force.

Now standard protection for many Air Force and Navy jet aircraft, these flexible blankets insulate and protect the airframe against searing heat generated by jet power.

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In addition to insulating tail pipes, engine cones, turbine casings and afterburners . . . Thermoflex Blankets in special preformed shapes are used to insulate, protect, and fireproof fluid storage tanks, air-conditioning systems, thermal de-icing ducts and many other assemblies in all types of aircraft.

Why not send for your free copy of the illustrated folder IN-136A? It tells the complete story of Thermoflex Blankets for aircraft power plants and airframes. Address Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

*Reg. U.S. Pat. Off.

JOHNS MANVILLE JM PRODUCTS **Johns-Manville** PRODUCTS for the AVIATION INDUSTRY

pends on hairline balancing of combustion factors in a procedure that is hard to duplicate, says Reichelm. In fact, his unit works in practice, but not in theory, he asserts.

A recent development that dovetails with the Gasifier for aircraft piston engine use is the Diverter Segregator Finned Hopper aircraft oil system for cold-weather starting, described in AVIATION WEEK July 7, p. 64.

▶ **Gasifier History**—Reichelm first installed the Gasifier in a jet while doing research for a leading aircraft engine manufacturer.

It was by use of the Gasifier in this work that he was able to obtain engine performance suitable to generate research data needed, Reichelm claims. A Furnace Gasifier, for industrial and home heating units, promises a 50% saving for the latter and 20% for the former in fuel bills, he believes.

The Reichelm plant takes up a part of the former Chance Vought facilities at Stratford.

Aero Transmission Drives Tested

A space-saving rig utilizing low horsepower to test high-horsepower aircraft transmission drives under maximum performance conditions has been devised by the Technical Development Co.

The drive motor of the stand needs only 20-25 hp. to turn a gear case transmitting 300 hp. through full load, rpm. and endurance conditions, according to the firm.

Gear cases can be tested without supervision for the length of time desired, the company says. Safety controls halt operation if stand or part being tested malfunctions. Various transmission components like universal joints, couplings and drive shafting can be tested.

Technical Development Co., 22 Meredith Rd., Philadelphia 31, Pa.

New De-Icer Fluid

A non-flammable-type de-icing fluid, claimed to eliminate the fire hazard of alcohol-glycol mixtures and to be two to five times faster-acting, was developed for airline use by Fine Organics, Inc.

The product, called "Stratofrost B," is said to embody entirely new principles of ice removal and frost prevention. Factors of corrosion, effects on rubber, paints and other materials weighed heavily in its selection, the company notes. It says performance of the new compound is superior to alcohol-glycol formulas conforming to Air Force Spec. 3609.

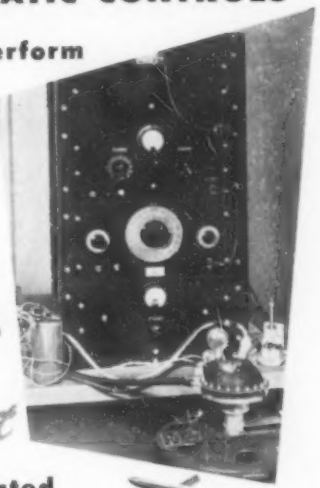
Fine Organics, Inc., 211 E. 19 St., New York 3, N. Y.

AEROTEC AUTOMATIC CONTROLS

are test-proven to perform

Exactly

to your specifications



Actual flight

conditions are duplicated in Aerotec test laboratory

This Aerotec sensitive low pressure differential switch utilizes ram-air

Standards of quality, workmanship and efficiency that you specify are met in Aerotec Automatic Controls. Aerotec specializes in *custom-built* instruments and controls that safeguard automatic operations on military and commercial aircraft.

Before delivery, Aerotec controls undergo rigid tests of extreme temperatures, rarefied atmosphere, and others, simulating actual service conditions. For example, a typical test is underway on the vibration test equipment shown above in the Aerotec laboratory. This equipment subjects the control to vibrations up to 70,000 cycles per second and 10g's acceleration.

Extreme care marks every step of design, manufacture, and testing at Aerotec. That is a big reason why every major U. S. aircraft manufacturer uses Aerotec Automatic Controls. Let us help with *your* control problems. Call or write.

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DAYTON 3, OHIO — Jay Engineering Co., 1517 East 3rd Street
LOS ANGELES 43, CAL. — Forsnas Engr. Co., 4545 West 62nd St.
SEATTLE 2, WASH. — Stanley R. Brett, John E. Freeman & Assoc., 1529 9th St.
WICHITA 8, KANSAS — John E. Freeman & Assoc., 4913 East Lewis Street

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Designers and Manufacturers of Automatic Controls—*Valves:* Regulating, Relief and Check types—*Pressure Switches:* Gage, Altitude, Differential and Absolute Types—*Float Switches:* Top, bottom or side mounted—Single, Dual, or Tandem.

Tubeless Tires for Hot Jet Planes

Tubeless tires for jet planes may soon be a reality. First such tires currently are undergoing final test by the maker, B. F. Goodrich Co.

Conditions which the tire must meet are cited as: serviceable at temperatures ranging from 65F to 160F, withstand landing speeds up to 250 mph. The tubeless tire is "particularly significant on current military airplanes where the tendency is to use smaller and smaller tires for steadily increasing loads at higher and higher pressures," according to T. G. Graham, company vice president.

Construction features of the tire: use of a layer of special American-made rubber inside the tire to seal in air, replacing the inner tube; special ridges molded on outside of tire to prevent loss of air around rims.

Graham listed these advantages:

- **Weight reduction** of overall tire assembly.
- **Cooler running** which should contribute materially to stretching tire life.
- **One unit** does the job of two, simplifying inventory and supply problems.
- **Simplification** of mounting and dismounting tires by eliminating troublesome tube handling.
- **Closer control** of tire balance possible, minimizing high-speed spin-up vibration.
- **Danger** from blowouts and deflated tube entanglement is greatly reduced by the new tires.

Goodrich started development on tubeless tires for aircraft during World War II, made the first experimental tire in 1946, according to Graham.

Portable Unit Tests Aircraft Nacelles

An aircraft nacelle tester, capable of checking 200 electrical circuits in 10 sec. is being manufactured by the Bogue Electric Mfg. Co.

The portable instrument, smaller than an apartment-size piano, plugs into an aircraft nacelle with a quick-disconnect plug.

A motor generator set, incorporated in the rig, provides power to operate actuators, servos, and other gearing within the nacelle. The tester can also check selsyn transmitters, according to the manufacturer.

The set will also test reversible propeller circuits and electric variable-pitch propellers, the maker says.

Big advantage of the tester is elimination of time-consuming hand ringing out of individual circuits, the Bogue company claims.

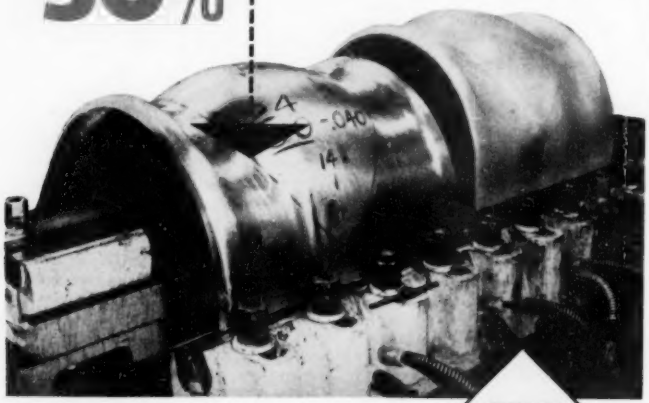
Regular deliveries of the unit are now being made.

Bogue Electric Mfg. Co., 52 Iowa Ave., Paterson, 3, N. J.

Cut stretch die costs 50%

...with REZOLIN TOOL-PLASTIK

the only non-shrink casting resin



A thermosetting liquid phenolic plastic of exceptional dimensional stability and ease of handling, Rezolin Tool-Plastik is mixed cold and readily poured without pressure into simple molds. Tool-Plastik tooling is easily manufactured in your own plant without expensive shop equipment or highly skilled labor. *Non-Shrink* Tool-Plastik eliminates the need for shrink patterns. Tools are used with cast-in finish, eliminating the time and cost of blue-blocking and die barbering. Tool-Plastik replaces critical cast metals.

STRETCH DIE
Produced in 50% of the time and 1/7 of the weight of a metal die for Lockheed Aircraft.

SAVES TIME—Tool-Plastik cuts tooling time 50%. Repairs and modifications are made more easily and quickly.

DURABILITY — Tool-Plastik will not crack from undue internal stresses and strains—flexural strength 8,000 psi, compressive strength 11,000.

ACCURACY—Close tolerances are assured because Rezolin Tool-Plastik does not shrink when cast.

LIGHTER — Tool-Plastik effects weight savings as high as 70%.

Complete 6¼-lb. sample kit for $5.31. Freight postpaid. Write for Stretch Die Application Technical Bulletin AW-10.

REZOLIN, INC.
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REZOLIN TOOL-PLASTIK

BIG STICK

Even the formerly simple control stick reflects the increasing complexity of modern fighters. Republic Aviation's test pilot R. E. Armstrong compares the stick of an early World War II fighter (left) with one from an F-84G Thunderjet. F-84G stick buttons and controls are: (1) microphone, (2) autopilot disengage, (3) gun trigger, (4) bomb release, (5) trim tab control, and (6) radar control.

Something new under the star

Newest U.S. Air Force fighter will be a Convair-built, very-high-performance interceptor. By being selected to produce this interceptor, Convair has attained leadership in *all basic types* of aircraft – bombers, trainers, transports, fighters and water-based planes. Proof again, that Convair engineering achieves the maximum of air power...

Engineering to the Nth power!

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☆ ☆ CONVAIR IS ADDING ANOTHER 1¼ MILLION SQUARE FEET OF FLOOR AREA TO ITS PLANT FACILITIES... MAKING A TOTAL OF MORE THAN 9 MILLION SQUARE FEET DEVOTED TO RESEARCH AND PRODUCTION PROJECTS FOR AIRCRAFT, GUIDED MISSILES AND ELECTRONICS!

ENGINEERS-

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Salaries commensurate with ability and experience • Paid vacations • A growing organization • Complete employee service program • Cost of living bonuses • Six paid holidays a year • Finest facilities and equipment • Excellent opportunities for advancement • Group insurance including family plan • Sick leave time off • Transportation and moving allowances • Employees Credit Union • Educational refund program • Low-cost group health (including family) and accident and life insurance • A company 24 years young.

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Dept. 10, Engineering Personnel Office
Los Angeles International Airport
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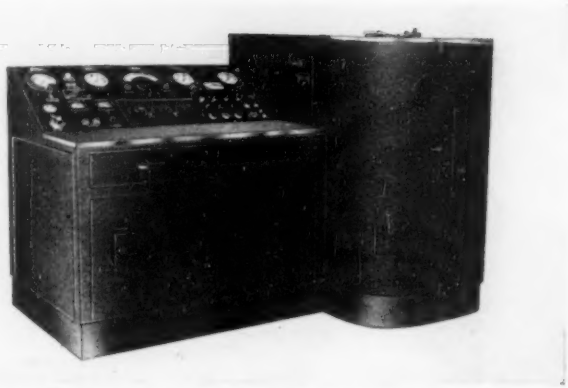
North American Has Built More Airplanes Than Any Other Company In The World



GREER GOVERNMATIC tests reverse-pitch and full-feathering prop governors.

Greer Makes New Test Stands

Greer Hydraulics has come up with several new models of test stands for the aviation industry. Among them:

• **Non-flammable fluid stand** ordered by KLM Royal Dutch and United Air Lines for testing hydraulic components operating on Skydrol fluid, such as hydraulic cabin supercharger drive circuits in the DC-6 and DC-7. These are among the first stands tailored for Skydrol.

The stands in a small model, 6SESV-9V ordered by KLM, and a large, 10SE3V-20V ordered by United, provide a power source and all necessary controls and instruments to permit speedy and accurate testing of hydraulic system components at pressures up to 5,000 psi. and flows up to 9 gpm. and 20 gpm. respectively. There is a manually controlled unloading valve and a accumulator circuit, and a foot pump circuit for static and leakage tests up to 10,000 psi.

• **Pneumatic test stand** developed by Greer in consultation with such firms as Republic, Boeing, Fairchild, General Motors and Lockheed on such programs as the F-84 jet fighter-bomber and the B-47 jet bomber. Equipment has been delievered to Wright Field and to the Naval Gun Factory, says Greer.

It is composed in the main of either a booster cylinder, or an air compressor with electric motor, a muffler and automatic pressure regulators. Air is supplied by several circuits—a static air circuit for pressures up to 6,000 psi., and a vacuum circuit with a 2-stage, 9-cfm. vacuum pump capable of producing .001 mm. Hg and a vacuum chamber with a 700-cu. in. capacity. Maximum flow conditions are 300 cfm. at 5,000 psi. using a booster cylinder. An aftercooler assembly, moisture eliminator and necessary controls and instrumentation are included.

• **Improved Governmatic test machine** is being supplied to military services and distributed to foreign markets by United Aircraft Export Corp., div. of United Aircraft Corp. This stand has been redesigned by Greer in cooperation with Hamilton Standard to test the latest double-capacity, double-acting, reversible-pitch and fully feathering propeller governors. The equipment has a 7½-hp. drive and a pump providing pressures up to 1,500 psi. An adjustment simulates the sensitivity of the particular governor under test.

• **Universal tester for electric systems** components in aircraft, particularly power generating and control units, is a recent development of the firm. Designated EL-100, it has a three-phase balanced load bank to test inverters and alternators, a direct current load bank for testing generators and related d.c. units.

The company also is expanding its output of air bottles for pneumatics, both grounded and airborne. They are available in capacities from one pint to 10 gal. Nitrogen is used because of its non-explosive qualities. Bottles are made of seamless, chrome molybdenum steel for 3,000-psi. and 6,000-psi. systems. The latter are burst-tested at pressures up to 24,000 psi.

Greer Hydraulics, Inc., 454 Eighteenth St., Brooklyn, N. Y.

Fast Gun Camera For Speedy Jets

A new recording gun camera specifically designed for use in highspeed jet planes is being delivered to the USAF.

Labelled the N-9, camera is capable of operating at speeds of up to 64

Flight Test Opportunities

for

- **EXPERIENCED FLIGHT TEST INSTRUMENTATION ENGINEERS**
- **FLIGHT TEST ENGINEERS**
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Dealing with

- **GUIDED MISSILES**
- **AIRPLANE SYSTEMS**
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The Missile and Control Equipment Laboratory of North American Aviation has openings in its flight test organization to handle flight testing of guided missiles and electronic control systems.

Excellent opportunities are offered for experienced engineers and analysts with airplane and guided missile flight test and flight test instrumentation background.

Outstanding opportunities are available on a long-range development program on basic guided missile work.

- **SALARIES COMMENSURATE WITH TRAINING AND EXPERIENCE**
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Give complete resume of education, background and experience.

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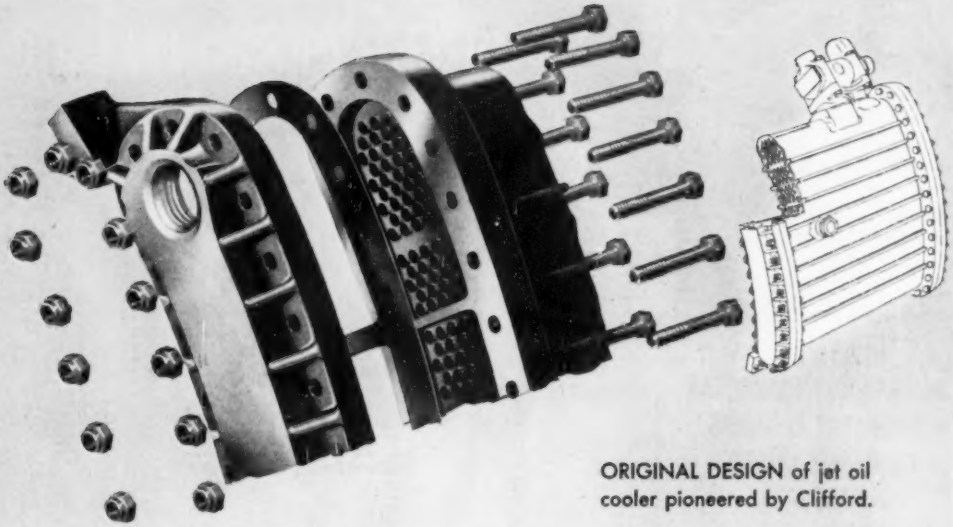
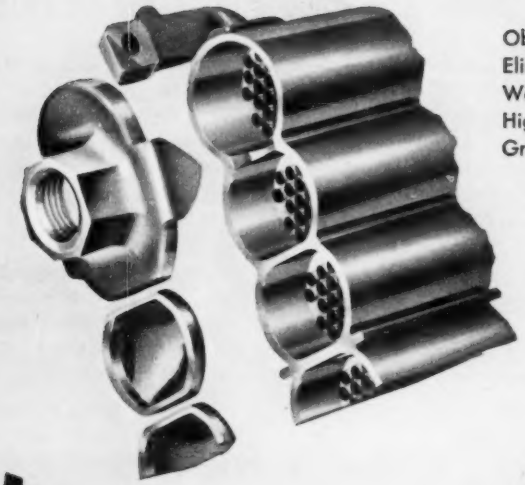
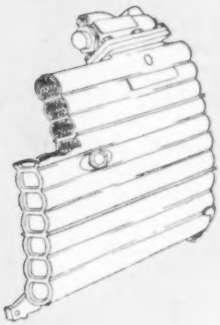


ORIGINAL DESIGN of jet oil cooler pioneered by Clifford.



ADVANCED DESIGN

Obvious Simplicity
Elimination of Gaskets, Bolts and Nuts
Weight Saving of 28%
High Pressure Rating
Greater Ease of Servicing



38.2.29

Again . . . Clifford Oil Cooler

engineering keeps pace with turbojet progress

Engineering achievements like the one shown above are made possible by Clifford's unique patented brazing method and laboratory facilities . . . the largest and most modern in the aeronautical heat exchanger industry.

For information on Clifford oil coolers write: Clifford Manufacturing Company, 136 Grove St., Waltham 54, Massachusetts, *Division of Standard-Thomson Corporation.* Sales Offices in New York; Detroit; Chicago; Los Angeles; Waltham, Massachusetts.

HYDRON METAL BELLOWS — CLIFFORD MANUFACTURING CO. WALTHAM, MASS. — HEAT EXCHANGERS

CLIFFORD HEAT EXCHANGERS
. . . CUSTOM ENGINEERED
FOR MORE EFFICIENT HEAT TRANSFER

frames per second, giving an exposure of 1/1,000 sec. Maker says this is fast enough to stop the speediest kind of jet action, even when approaching from opposite directions.

The N-9 is made by the Bolsey Corp. of America which cites these features of the camera:

- **Capable** of withstanding gravity loads up to 25 Gs with no effect on camera operation.
- **Small size**, about the size of a person's hand.
- **Remote** control and fast operation.
- **Handle** single or double perforation film (50 ft., 16mm. magazines), sound or silent, black-and-white or color.
- **Withstand** extremes of temperature, from −65F to 160F. Automatic heater prevents lubricants from freezing.
- **Adjustable** exposure has three settings, "hazy," "dull," "bright," operated from remote control instrument box in cockpit.

Camera starts the instant guns begin to fire and continues photographing after guns stop to record all action required.

Bolsey address: 118-120 E. 25th St., New York 10, N. Y.

From Mine Pit To Flight Line

United Air Lines' inspectors now use miner-type lamps to illuminate parts of aircraft they are inspecting. The lamps, designed for use in gaseous mine atmosphere, are ideally suited for use around planes, especially in fuel tank areas. Lamps are equipped with two filaments of equal power candlepower so light is furnished without interruption in case one burns out.

If lamp lens and bulb break, contact at bulb base is automatically interrupted so filaments cool off and become incapable of igniting a gaseous atmosphere.

The nickel-iron-alkali battery is reported to be unaffected by long idle periods, does not require constant recharging and lasts for years, the maker

Fuel tanks suffer from pressure, too — may overpressurize or collapse during extremes of high performance range. Fuel Vent and Dive Relief Valves by Carter, to permit high performance, are standard equipment on the North American Navy FJ-2 Fury and the Air Force F-86D Sabre Jet.

These special-purpose solenoid valves, designed and manufactured by Carter, are "fail-safe" and suitable for use in ambient temperatures of −65° to 250°F. Simplicity of operation insures dependability!

No. 5058
Fuel Vent Relief
2" Line Size
1 PSI △P at 200 CFM
Air Flow

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Your inquiry stating your problem in this field is cordially invited.

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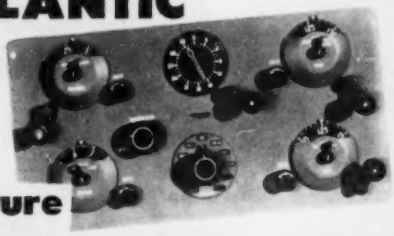
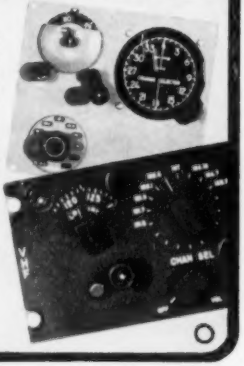
Let ATLANTIC design and manufacture your RADIO CONTROL UNITS



Because of ATLANTIC's many years of electronic experience, leading radio and aircraft manufacturers have come to us to design and manufacture in quantity, compact cockpit consoles, housing in a single, easily installed unit all the radio controls.

Meeting all applicable specifications, ATLANTIC custom-designed and volume-produced radio and other electrical control units can relieve you of valuable engineering time and many installation problems. No doubt we can help you, too.



Atlantic Aviation CORPORATION

TETERBORO AIRPORT, TETERBORO, N. J.

WITH HANSEN COUPLINGS

MINUTES SAVED ARE HOURS GAINED

CONNECTION takes only a second

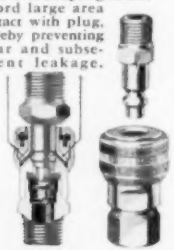
With Hansen couplings you save precious minutes every time you connect or disconnect a fluid line carrying gas, liquid or grease.

To connect, you merely push plug into socket—flow starts instantly. To disconnect, pull back sleeve on socket—coupling disconnects. Flow is shut off instantly and automatically.

From a wide range of available sizes and types, you can select a Hansen coupling exactly suitable for your application—each type engineered to meet its special requirements.

One-way shut-off, two-way shut-off, and straight-through types. Write for catalog giving complete listing of sizes and types.

Locking pins in Hansen Push-Tite Coupling Socket afford large area contact with plug, thereby preventing wear and subsequent leakage.



REPRESENTATIVES

Baltimore	Denver	Louisville	Rochester
Birmingham	Detroit	Milwaukee	San Francisco
Chicago	Ft. Wayne	Minneapolis	Savannah
Cleveland	Hartford	New Orleans	Seattle
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Export Department: Cleveland

THE HANSEN MANUFACTURING COMPANY

4031 WEST 150th STREET • CLEVELAND 11, OHIO

says. Carried in coverall hip pocket, it gives 10 hours of continuous lamp use at one charging.

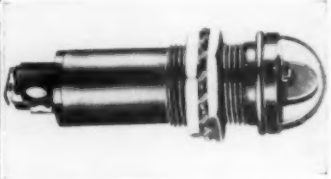
The lamp is Edison R-4, distributed by Mine Safety Appliances Co., Pittsburgh, Pa.

OFF THE LINE

European sales rights for Stratos products have recently been granted to Inter-Technique, S.A.R.L., of Paris. The rights, exclusive in all continental European countries except Switzerland, are for such Stratos products as military and commercial aircraft air cycle refrigeration packages, cabin superchargers, air-turbine drives, etc. The equipment will be manufactured at the new Bay Shore, N. Y., plant of Stratos division of Fairchild Engine and Airplane Corp.

Manufacturing sound suppression equipment for aircraft engine manufacturers is proving to be big business for Industrial Sound Control, Inc., Hartford, Conn. The company announces recent new orders brings its soundproofing backlog to $4.25 million. Customers include Wright Aeronautical Corp., with orders for "Soundstream" aircraft engine silencing devices; Buick Jet Engine division, $286,000 soundproofing work for its test cells, and Douglas Aircraft Co., two run-up mufflers for airstrip engine testing.

Hong Kong—Kai Tak, Hong Kong's slightly-difficult-to-approach airport is going to get some face-lifting. A. R. J. Moss, Director of Civil Aviation in Hong Kong, told AVIATION WEEK that the east-west runway is being extended from 4,500 ft. to 6,000 ft. A gradient will be built at one end to help slow up landing aircraft, especially jets such as the de Havilland Comet and heavy jobs like the Boeing Stratocruiser. And



BULBLESS LIGHT

A light that never fails is this bulbless signal lamp. For cockpit warning, to tell of power failure, device has solenoid-actuated tab coated with luminous material which is shut off from view if power fails and tab retracts. Indications in various colors available. Lytle Engineering & Mfg. Co., 4721 N. Kedzie Ave., Chicago 25, Ill.

down-grade takeoffs in the opposite direction will give these aircraft a welcome boost. In addition, the current runway on a 130 deg. heading is being moved to 145 deg. and extended to a length of 8,000 ft.

NEW AVIATION PRODUCTS

Cylinder Timesaver

A newly developed aircraft engine cylinder heating bench is saving Pan American World Airways over 2,500 manhours a year, the airline estimates.

Developed by one of its mechanics at Miami Overhaul Base, the unit heats four cylinders at once to 400F for guide, valve seat and port coupling placement. It does the job in 6½ min. instead of the 17 min. formerly required.

The heating bench also greatly reduces use of Chorlastic which was burned off by old heating method.

Unit is in use at Miami (where 16,000 cylinders are processed annually) and at the airline's Brownsville, Tex., base.

Ordered Climate

KLM Royal Dutch Airlines has bought a special refrigeration truck from M. L. Engineering Co., Ltd., a British firm, to keep plane interiors cool during stopovers at New York International Airport.

The truck is a six-wheeler trailer unit. It draws the warm air from the cabin, cleans it, filters out dust, and cools it.

It is capable of producing enough refrigeration in an hour to make 25 tons of ice.

During cold weather it is used to heat the cabin.

Similar American-made ground air conditioning units have been in use for some time in the U. S.

M. L. Engineering Co., Ltd., Slough, Bucks., England.

Metallic Seals

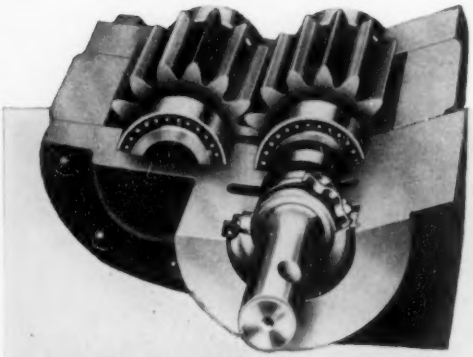
Metallic torus seals, particularly suited to aircraft jet engine application have been put on the new products counter by the D.S.D. Mfg. Co.

The precision-made, seamless units, labeled Toruseal, are made of stainless 18-8 stainless steel and can withstand temperatures of −150 deg. to over 1,000 deg. Toruseals are also available in these stainless steel alloys: AISI 316, 321, 347, 410 and 430, in mild steel and nickel alloys such as Monel and Inconel.

Address: 2964 S Whitney Ave., Hamden, Conn.

"Lean Carilloy alloy steel is saving us $40 a ton with no loss in performance."

—T. C. Kane, Chief Engineer,
Commercial Shearing & Stamping Co.



IN THESE ROTARY PUMPS made by Commercial Shearing & Stamping Co., oil is trapped between the teeth of two meshing gears. Speeds are exceptionally high, and the gears must be tough and durable. Lean Carilloy alloy steel meets service requirements and lowers costs.

THE GEARS are machined directly from round bar stock. First step is hobbing, shown below.

Commercial Shearing & Stamping Co., of Youngstown, Ohio, is another manufacturer who, unable to obtain rich alloy steel, is now using *lean* alloy steel for heavy-duty parts that must operate in extremely tough service. Here is their experience, as told by Mr. T. C. Kane, Chief Engineer:

"We used to make the gears for our heavy-duty gear-type hydraulic pumps out of a rich alloy steel, Carilloy 4615 (1.65-2.00% nickel). But when nickel started getting scarce we had to find a steel in better supply that would stand up in really hard service.

"Our pumps operate at pressures as high as 1,500 psi and at speeds up to 2,000 rpm. Gear wear of only 0.005 inch causes a substantial drop in pump efficiency; so we need a tough, wear resistant steel for the gears. The question was, could we get the necessary properties in a *lean* alloy steel?

"U.S.S Service Metallurgists helped us out. They recommended Carilloy 5120, a straight-chrome alloy. We are frankly surprised at the excellent results we're getting with this steel. Not only do the gears meet all of our high performance standards but this lean alloy steel is easier to machine and heat treat. And we pay a lower grade extra on it. All told, the change to lean alloy steel saves us $40 on every ton of steel we buy."

The switch from rich to lean alloys is not always as easy as it was at Commercial Shearing & Stamping Co. You may require special heat treating, or simply more *careful* heat treating, to obtain desired mechanical properties. But whatever your steel problems, our metallurgists will be glad to help you with them. Just call our nearest District Sales Office, or write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

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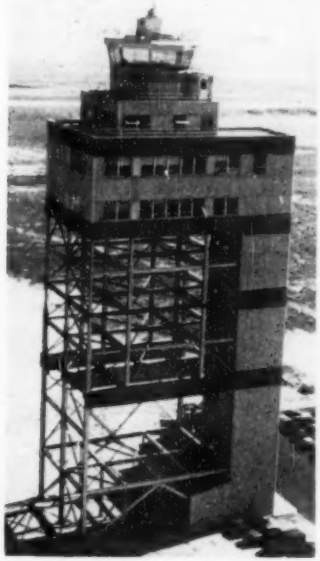


CONTROLLER'S POSITION (above) is one of three such setups on the 11th floor. The two scopes, right of center, belong to new Airport Surface Detection Equipment.

IDLEWILD CONTROL TOWER (left) rises 150 ft. above center of 4,900-acre terminal.

Surface Radar Being Tried at Idlewild

- **Airport's new control tower fitted with equipment to aid in monitoring taxiing aircraft.**
- **It's the first such application at a commercial field and is expected to speed traffic control.**

By Philip Klass

Airport Surface Detection Equipment (ASDE), more popularly called "taxi radar," is being used for the first time to control scheduled airliners on the ground. The installation is being tried at the recently dedicated N. Y. International Airport control tower. ASDE is a low-power, very-high-frequency radar specifically designed to show up objects on the surface.

The million-dollar control tower, called the world's largest and most modern by the Port of N. Y. Authority which leases it to CAA, stands 150 ft. high, equivalent to an 11-story building. The structure is stressed to withstand 90-mph. winds and has an elevator to the seventh floor; from there it's a walk-up.

The IFR (instrument approach) control room, housing the Gilfillan surveillance and precision approach radar scopes and operators, is on the seventh floor. Radio transmitters and receivers are located on the eighth, and three floors above is the VFR control tower for final landing control. This room contains a duplicate surveillance radar scope and has an interphone connection to the IFR room.

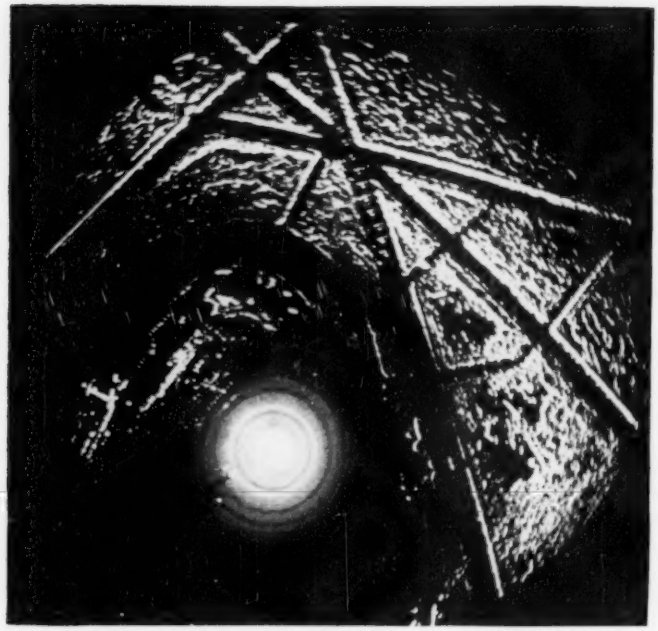
▶ **Why Taxi Radar?**—ILS and GCA instrument approach facilities have so speeded up instrument-weather landings that the limiting item at some airports is now the controller's ability to clear the runways and taxiways. That's where the new taxi radar should help.

Airport Surface Detection Equipment gives the control tower a radar picture of all aircraft on the ground, airport runways, taxiways and fixed installations. The device will answer a pressing need during night and instrument-weather operations, but it will also be useful during daylight operations. At an airport as large at N. Y. International (4,900 acres), with runways nearly two miles long, perspective viewing makes it hard to tell an airplane's exact position on the runway, even from a 150-ft. control tower.

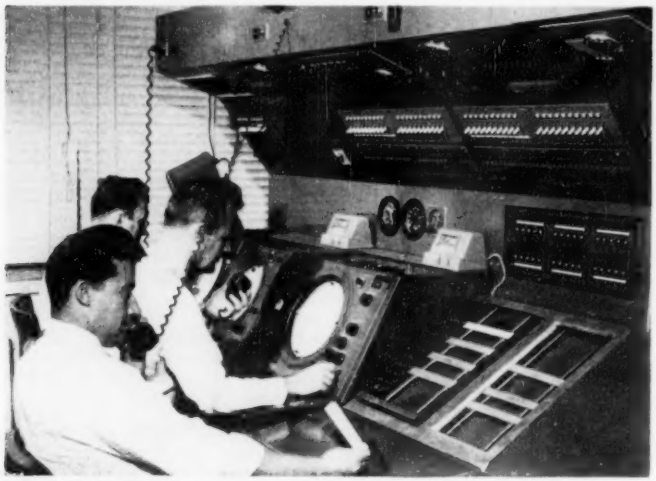
▶ **ANDB Project**—The ASDE at Idlewild is an Air Navigation Development Board-sponsored project under the direct supervision of USAF's Rome Air Development Center. It was originally developed by Gilfillan and evaluated by CAA at Indianapolis (AVIATION WEEK Mar. 31, 1952, p. 73). Later it was turned over to Airborne Instruments Laboratory, Mineola, N. Y., with a contract from RADC to investigate possible ways of improving picture resolution and general performance. This was no reflection on Gilfillan since the equipment was the first taxi radar ever developed.

▶ **The Picture**—The radar scope picture resembles a relief map with roads and runways showing up as long dark areas; grassy areas (with vegetation to reflect the radar pulses) give a bright echo. Aircraft show up as small bright blobs against the black runways. Under favorable conditions, the airplane echoes take on shape with wings and tail discernible, AVIATION WEEK was told during a demonstration at Idlewild.

AIL and RADC representatives freely admit that there is room for improvement in definition, airport coverage and



RADAR PICTURE of Idlewild International Airport given by ASDE shows considerable detail, including images of DC-6 transports taxiing on runway (right of center).



CONTROL CONSOLE in instrument flight rule room on tower's seventh floor. Precision approach and airport surveillance radar scopes are being monitored.

reliability of the present unit. It is clearly an experimental installation. ANDB and the USAF are sufficiently impressed with the potentialities of, and need for, taxi radar that AIL has been given another contract to develop a new and improved ASDE for Rome Air Development Center.

RADC has assigned one of its technicians, Brant Conway, to spend full time with the equipment during its six-month trial at Idlewild.

▶ **Radar Highlights**—The present ASDE is a K-band (1.25 cm) radar. (Peak power, pulse repetition rate, pulse length, and other details of the radar are classified.) The antenna is located atop the control tower, on a cubicle housing the radar transmitter and receiver. The antenna scans at one revolution per second and generates a cosecant-squared beam about ¼ degree wide in azimuth and about 9 degrees high in elevation.

The very short K-band wavelength used to give the ASDE its good definition, makes it vulnerable to attenuation from precipitation. An Airborne Instruments Laboratory engineer, Joseph Woodward, says that one of the objectives of the Idlewild installation is to determine how frequently heavy rainfall deteriorates the radar picture sufficiently to make it unusable.

▶ **Avionics Center**—In addition to its taxi radar, the new control tower has more than $600,000 of radio and radar equipment, including:

- Fifteen radio receivers (11 VHF, 3 HF, and 1 LF).
- Two VHF transmitters (each capable of operating on any one of five channels).
- Ten remotely located transmitters (one LF, nine VHF) have connections to the tower.
- Seventy-five telephone lines (for communications to other CAA control points and the airlines).
- Surveillance and approach radars.
- Three separate electrical power sources.

Engineer Station Ruled Out for DC-7

Although airline pilots and flight engineers have proposed that the Douglas DC-7 have a segregated instrumented flight engineer station, American Airlines, United Air Lines and Douglas Aircraft Co. are dead set against the proposal. An AA official says it is out of the question.

The DC-7, like the domestic versions of the DC-6 series, accommodates the flight engineer with only a jumper seat between pilot and co-pilot. He reads their instruments.

Flight engineers and some pilots argue that the high performance of the DC-7 and its compound engines warrant a separate engineer station such as on Pan American and TWA over-ocean planes. This, they argue, would simplify the pilots' cockpit instrumentation by removing secondary controls and instruments to the flight engineer station.

But the airlines and manufacturer say this would require major re-work of the DC-7 at prohibitive expense. One of the major advantages of the DC-7 is its DC-6 series parentage, giving proven control set-ups. Aside from the expense, they say another disadvantage would be the risk of radical change.

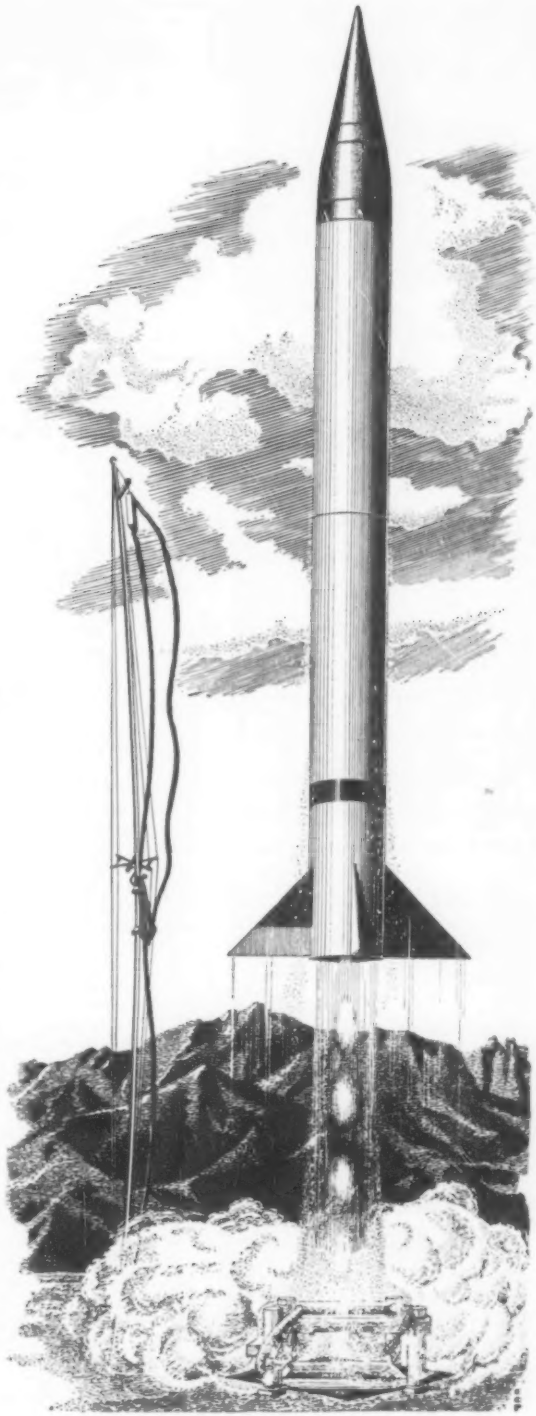
The jet transport of the DC-8 series will be time to change to a flight engineer station on domestic operation, an American Airlines officer told AVIATION WEEK.

Research Rides a Rocket

The Naval Research Laboratory's Viking rocket research at White Sands Proving Grounds, N. M., hunts facts, figures and formulas in the upper atmosphere.

HURTLING far into the blue, Naval Research Laboratory rockets ask questions of the earth's upper atmosphere . . . flash back the answers needed to guide the designers of tomorrow's piloted and pilotless super-altitude systems for peace or war. What are the pressures and temperatures of the earth's atmospheric layers . . . the high-altitude changes in the earth's magnetic field affecting navigational instruments . . . the alterations in radio waves caused by the ionosphere . . . the effects of sun spots on communications equipment out beyond the filtering effects of the earth's heavy atmosphere?

Martin Viking rockets play a major role in this high-altitude flight research program. Last summer, the Viking cracked the world's altitude record for single-stage rockets . . . nosing 136 miles into the heavens at a top speed of 4100 m.p.h. Now, an even more powerful Viking is being readied for launching. The Martin Company is proud to be a partner with the Naval Research Laboratory in these vital activities . . . helping to prove that America's most valuable secret weapon is its scientific leadership! THE GLENN L. MARTIN COMPANY, Baltimore 3, Md.



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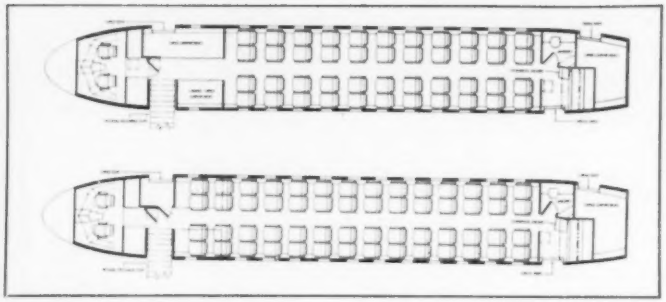

CONVAIR CONVERTIBLE seating arrangement for its 340 maximizes revenue potential of the airframe by allowing daily or occasional changes from 30 to 56 passengers to meet varying route, competitive and seasonal demands, Convair says. Top sketch shows 44-seat version, bottom a 56-seat layout.

Pilots Take Look at Convair 340

The Convair-Liner 340 appears generally improved over the smaller 240 but still needs a few minor modifications, an engineering evaluation committee of nine airline pilots reports. One of the committee, L. Homer Mouden of Mid-Continent Airlines, summarizes their flight test findings in the current issue of the Air Line Pilots Assn. publication, the "Air Line Pilot."

Chief modifications recommended:

• **Move feathering control.** Feathering buttons and warning lights are on the cockpit roof. Pilots want them lowered to the fire-control panel where routine check is easy. Prop feathering is a logical function of fire control anyway, Mouden says.

• **Fix mixture control.** On the throttle quadrant, there is a possibility of pulling back the mixture control lever when you want the carburetor heat lever. United Air Lines has installed a locking device to prevent inadvertent cut-off on the fuel mixture.

• **Improve flap position indicator.** Pilot Mouden recommends installing a bigger and better-located flap position indicator. Flap position is critical on modern high-performance transports, he points out.

• **Move taxi light.** The 340 taxi light is on the nosewheel strut so it can't be used except in taxiing and final approach. The pilots unanimously recommended moving the light to the plane's nose because they use it more in flight than in taxiing. They find it useful for checking ice, precipitation, identification and warning.

These appear the only important modifications recommended by Mouden as desirable, after the pilot committee evaluation.

Some major items noted, indicating generally satisfactory performance and design of the plane:

• **Bigger tires and landing gear** for smoother landing and taxiing in all weather.

• **More powerful engine,** the R2800-CB16, gives full 2400 hp. at takeoff with some reserve throttle left, permitting maximum allowable power for hot-day and high-altitude takeoffs. Lack of this was a weakness of the CA18 engine, Mouden says.

• **Excellent visibility** in the new cockpit may be "due in part to the ALPA committee's suggested changes to the original cockpit mockup of the 240 during design stages. This amplifies the importance of pilot participation in airline transport design," writes Mouden.

• **Quieter cockpit.**

• **Throttle warning horn** to prevent takeoff without flaps is a good safety device, as the Convair is not certificated for zero flap takeoff. "Such 'reminder' devices are indications of sound cockpit engineering," Mouden comments.

• **Exhaust use for heating** of cockpit, cabin and wing and tail surfaces is "highly favored" by ALPA over the combustion heaters commonly used by other manufacturers. And the 340's improved controllability of the heat output "should enable the 340 to handle even more ice than does the 240."

• **Anti-collision light** fixture to be placed atop the vertical fin "gratified" the pilots. The light is not installed yet, but United Air Lines is producing one.

• **Increased wing dihedral** improves flight stability.

• **Stall characteristics** are good, Mouden says. Prestall warning is adequate, aileron control remains even during the stall, and the plane "did not show a tendency to whip" in power-on stalls.

Mouden concludes: "If no unforeseen characteristics are exposed during scheduled operations, the 340 should prove a very efficient and economical airplane, and one that the pilots will enjoy flying."

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Navy Presses CAB To Switch to Knots

Navy is putting the heat on Civil Aeronautics Board to go ahead and standardize civil air navigation on knots and nautical miles as CAB originally planned before backing down last June under industry pressure.

Assistant Navy Secretary for Air John Floberg says he is "very much concerned over the failure of the CAB to adopt the nautical mile and knot as standard units of measurement for air traffic control in the United States.

"Without standardization . . . in procedures and in air traffic control equipment, safety in flight will be reduced on a rapidly descending scale," Floberg adds. Then he implies that this will hurt airline business, saying that the "implications" of the descending scale of safety "on the prospects of increasing air travel by the people of this country are obvious."

▶**Mph. Outmoded?**—He adds that "units of linear measure, based on such unscientific foundations as the length of three grains of barley or the length of the sovereign's arm may have satisfied all the requirements of the era of King Henry I or Edward I of England . . . but are grossly deficient for navigational purposes in the era of high speed and long distance air travel."

The nautical mile and the knot "are the only simple, practical and logical units for any navigation worthy of the name," said Floberg.

"The Air Coordinating Committee . . . has recommended its adoption throughout the U. S. in the interest of safe and expeditious handling of air traffic." The International Civil Aviation Organization, the armed services and other agencies such as the Coast & Geodetic Survey and Weather Bureau have all standardized on the knot. Only the CAB has not.

Civil Aeronautics Administration started warning airlines a year ago that the knot would become standard.

▶**CAB Reverses**—But at a hearing shortly before the July 1 deadline for switchover, Air Transport Assn. accused CAB of short-cutting due process of law by committing the industry to knots at the high-policy ACC level without getting full industry opinion first. ATA's operations-engineering vice president Milton Arnold embarrassed the Board with this accusation and representatives of lightplane owners told the Board they liked the old way of doing things.

The Board thereupon reversed its field and canceled the knot standardization order, further confusing airline operators—with half of them already converted to knots—and leaving the armed services facing a double-standard navigation system in the U. S.

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Mail Rate Works in Reverse

Trans-Pacific Airlines' high traffic loads of sightseers during a Hawaiian volcano eruption in July have caused Civil Aeronautics Administration to amend the carrier's mail rate formula. Here is why:

TPA's sliding-scale mail rate that month dropped to a minus figure and Trans-Pacific ended up owing Post Office $14,000 for the privilege of carrying the government mail. This situation occurred because mail rates of small airlines are set to decline as loads increase, and demand for TPA seats for July drove the formula rate into negative figures.

Because it operates on a "permanent mail rate," the airline can't get that $14,000 restored by a retroactive rate change. But to prevent this turnabout from occurring again, CAB now has amended the rate for the future, with a "floor provision" of 81 cents a ton-mile—the rate figured to be compensatory for TPA.

Extra-high loads have made sliding-scale mail rates go into reverse twice before—once on Capital and once before on TPA. Since the Capital occurrence two years ago, all permanent sliding-scale mail rates have carried floor provisions fixed at the CAB-estimated compensatory rate. But the Board hadn't gotten around to amending TPA's rate before the volcano boom. Now, only Trans-Texas has no floor provision.

Airport Facilities In Alaska Expanded

Construction projects for three airlines are under way at international airports in Alaska.

At Anchorage, a $215,000 hangar is being built for Northern Consolidated Airlines, while Northwest Airlines has ordered an 80-ft. extension to the CAA terminal building and control tower. Completion of the $1,751,025 CAA building is scheduled for next fall.

At Fairbanks, Wien Alaska Airlines is building a $400,000 hangar and shop building.

Wien has agreed that it will allow Pan American World Airways, Northern Consolidated Airlines and Alaska Airlines to use space in the hangar when available.

SHORTLINES

► **Air Transport Assn.** has published its statistical compilation, "Origination and Destination Airline Traffic Survey of Revenue Passengers for Sept., 1950," in five volumes. Formerly printed by CAB, this is the first of the twice-yearly surveys compiled and sold by ATA, at $25 a set plus postage. The data is used in airline economic studies and CAB cases.

► **Civil Aeronautics Board** has extended the deadline to Sept. 30 on its proposed regulation that would prevent air taxi operators from competing with certificated copter lines. . . . CAB also has extended the deadline on its ditching survival regulation proposals from Sept. 29 to Oct. 6; this would require passenger briefing, location of life rafts near exits, emergency lighting. . . . New CAB rules of practice allow cities and other public bodies and chambers of commerce to file to intervene in a case up to time of hearing; before, those groups had to get into a case before prehearing conference.

► **Bonanza Air Lines** has a CAB final mail rate of $727,948 effective July 15, 1952. Of that amount, only $13,000 is compensatory—the rest is subsidy. The total pay is estimated to yield a profit of $64,209.

► **British Overseas Airways** now has 135 fully trained air crew members for its Comet jet liner fleet—with 70 more in training now. Roster so far includes 24 pilot-captains, 16 co-pilots, 20 engineering officers, 29 radio officers, 24 stewards and 22 stewardesses. Comet conversion course for pilots takes 16 weeks.

► **California Central Airlines** claims an airline "first" in issuing more than 700 credit cards to individuals and 700 to business firms, entitling them to pay for flights on a monthly installment basis. Parties with "super credit ratings" get one-year cards, "strangers" get three-month cards and older customers get six-month cards.

► **Colonial Airlines** night aircoach services started Sept. 28 New York-Montreal and Washington-Syracuse. Tight scheduling of these trips will keep Colonial hopping. The same planes with short layovers all the way return to New York for Bermuda runs. Trouble anywhere along the line may hit the Bermuda schedules.

▶ **Eastern Air Lines** reports record New York-Miami traffic June-August totaled 148,980 passengers, 43% over a year ago.

▶ **Flying Tiger Line** August airfreight traffic hit a record of $659,815, up 22% from July and 60% more than a year ago. It tops the previous record—May's $522,000 volume. Biggest gains were machinery, electrical products. Vice President George Cussen predicts record load factors for the rest of the year.

▶ **KLM Royal Dutch Airlines** President Albert Plesman says KLM does not want the de Havilland jet Comet, series 1 or 2. The Constellation and DC-6 series can take care of Comet competition, he said.

▶ **Newark Airport** is slated for resumption of full-scale operations about Nov. 1 when the new runway No. 4 is ready, replacing runway No. 6 which routed traffic over the center of Elizabeth.

▶ **Northwest Airlines** reports load factors Sept. 1-15 at 72% compared with 73% in August and 74% a year ago. . . . Company next month will add one trans-Pacific all-cargo roundtrip a week to its three other weekly trans-Pacific schedules, all combination passenger cargo flights.

▶ **Los Angeles Airways** has a CAB-proposed mail pay increase from $443,009 a year to $506,000 a year to take care of increased cost during break-in of its growing Sikorsky S-55 fleet, effective Apr. 11, 1952.

▶ **Pan American World Airways** will construct a $610,000 maintenance hangar and office building at Seattle-Tacoma International Airport, near Seattle. PanAm has been operating its Alaska, Hawaii and Orient flights out of Boeing Field, but will move to the international airport when its new facilities are completed.

▶ **Pioneer Air Lines** says it's the "first" line to completely convert to dual installation of staticless VHF communications and navigation equipment.

▶ **United Air Lines**, NWA and PAA will increase U. S.-Hawaii fares 5% Nov. 1 because of rising operations costs. New rate must get CAB approval.

▶ **Wisconsin Central Airlines** has announced it will set up its administrative and main operating base at Twin Cities and has "reached an agreement" with the Metropolitan Airports Commission for a self-liquidating $2-million building program.

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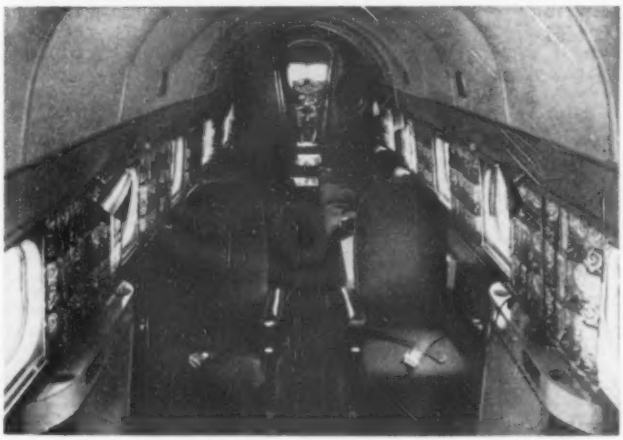

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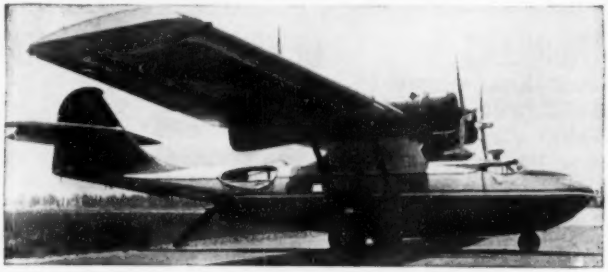

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COCKPIT VIEWPOINT

By Capt. R. C. Robson

Fear, Headlines & Safety

No factor retards the growth of air travel as much as the fear of death. Everyone has intelligent, average income neighbors who continue to travel by other means because they consider flying dangerous.

Much of this fear, of course, is poppycock. The industry can produce all sorts of statistics proving otherwise. But somehow these figures come off second best when matched against the usual headlines. It is possible that some day these headlines will not be considered front page material so often, and some of the "scare" may be taken out of aviation. This, however, is a doubtful thesis.

► **Crashworthy Aircraft**—A more promising solution would seem to lie in making the occupants safer by making the aircraft more crashworthy. This point is hardly a new one, but action on it has lagged horribly.

Consider the passenger seat. Has enough attention been paid to it? Has the design and strength of arm rests and seat backs, the padding and seat spacing been considered primarily in the light of luxury and economics or of safety? And the rear-facing seat—this has been kicked around for years. Some say: "People will not like them," "no proof they are better," "will not help unless the crash is straightforward," etc. Some of this reasoning is correct; certainly even the adherents of rear-facing seats do not call them a panacea. But let's look at it another way. How good are present seats? Can we lose by making a change?

Several past accidents have found a large portion of seats piled up in the forward part of the cabin, effectively blocking the exits.

Seat belts, too, have been known to leave their point of origin and produce similar results. It does not require much imagination to see that this catapulting must be prevented. Perhaps seat belts should be anchored directly to the frame of the aircraft or maybe the seat should be adorned with better bolts; the method is immaterial.

► **Crew Training**—Fire after crash is another well-known hazard. It wasn't long ago that a DC-4 bumped across a ditch in Philadelphia and burned up—with people. This leads one to ask "How fragile can an airplane be?" It also makes one wonder what happened to the talk about self-sealing fuel tanks, and what about automatic extinguishing systems and crash switches which turn off the electricity and turn on the fire equipment?

The difference between life and death in some accidents hinges on the previous training of crew and cabin attendants. It would be interesting to know what percentage of these people have had a worthwhile course in emergency procedures and how often they are reviewed. Some airlines, of course, do wonders here. They even have the girls jump down slides and pump foam on fires. On the other hand, some do not. The training of operating personnel in these matters should be a must.

The point of all this is that we are now building airplanes which can carry upwards of 100 people; we wonder how the industry will survive headlines with figures in three digits?

The record of today's "conventional" planes is good; but can we make it better? It is interesting to ponder what would happen if some manufacturer, despite the dire predictions of the public relations "experts" and the psychologists, went ahead and built a new airplane incorporating all the latest safety features.

Some of the material in this article may sound as though it comes from Crash Injury Research of Cornell University; it does. Few bulletins from the aviation industry sound as downright practical as do these of Mr. Hugh De Haven & Co. If this author may be permitted a recommendation, it is that everyone in aviation should read the work.

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Benefits available from using **Rotabin revolving shelving** to store parts, tools and materials are described and discussed in 16-page color catalog, **"The Science of Economical Shelf Storage,"** available from Frick-Gallagher Mfg. Co., Wellston, Ohio. . . . Catalog 82 contains 24 pages covering **precision snap-action switches** of safety, interlock and limit type and may be had by writing Micro, Freeport, Ill., division of Minneapolis-Honeywell Regulator Co.

The Harrisburg story is vividly illustrated brochure providing background on origin, growth, philosophy and principles guiding Aircraft-Marine Products, Inc., Harrisburg, Pa., maker of solderless wiring devices and fixed capacitors. . . . Variety of **forming, cutting and punching operations** in medium and lightweight materials handled by DiAcro metalworking machines is described in 32-page catalog which can be obtained from O'Neil-Irwin Mfg. Co., 516 8th Ave., Lake City, Minn.

Small castings services offered by the Dollin Corp., 600 S. 21st St., Irvington 11, N. J., are detailed in folder being mailed on request. . . . **Characteristics of silicone rubber** and chart summarizing the physical properties of 22 leading stocks are contained in bulletin, Silastic Facts No. 10, obtained by writing Dow Corning Corp., Midland, Mich.

Prepared for makers and users of metalworking equipment is bulletin D-2306 describing **packaged adjustable speed drive** used with electronic controls for rapid and accurate reversals for planer service. Write Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland, Ohio.

New Books

Air Navigation, Theory and Practice, by E. Brook Williams and W. J. V. Branch. Profusely illustrated with charts, diagrams and tables, 644 pages, including index. Published by Sir Isaac Pitman & Sons Ltd., London. Price 55 shillings (about $7.70).

This is for the advanced student who plans to make airline navigation his livelihood, and as such is a very thorough and up-to-date navigation treatise. There is a good, long chapter on navigational instruments for example, which goes into considerable detail as to their construction and how they work as well as how to utilize them in preparing calculations. Radar devices also come in for much discussion. Not only mechanical devices, but natural forces, are covered thoroughly.—**EPB**

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EDITORIAL

Airfreight & Defense

Friction between several members of the Civil Aeronautics Board and their Chairman, Donald Nyrop, may trigger a refreshing change in majority viewpoints on several vital subjects, including international air cargo.

Indignation among the membership over the extent to which the Chairman and the director of the staff conduct the agency's business, without members' knowledge, is reaching a slow boil.

There is some belief that these members are beginning to dig much deeper into pending cases, rather than to depend entirely on the material that is filtered to them from some of the Board staff.

The stiffening opposition to the Chairman by the unhappy members may bring a much more liberal and enlightened viewpoint, based on much more vigorous and independent researching, and an inclination to stand up and fight.

So that while the so-called trans-Atlantic airfreight case was decided under a Board of somewhat different membership, under another Chairman, the present members may make the most of the opportunity to revise the decision. President Truman recently rejected the decision and ordered the Board to reopen the case. An earlier Board had turned down both Seaboard & Western and Transocean for certificates to the Middle East.

After the White House returned the decision, Board members were described as embarrassed because some of them had never been shown certain correspondence sent to an earlier Chairman by the Defense Department, favoring more cargo service in the national interest.

An editorial here in July contended that the Board had frittered away this country's commercial air cargo leadership over the Atlantic by its stalling tactics and then by its negative decision, and it was pointed out that foreign carriers were running rings around Pan American and TWA in cargo operations between Europe and the U. S. It also noted that trade-wise Britain had just revised its policy to encourage independent, commercial air cargo companies to set up new routes.

A few weeks after the editorial appeared, both TWA and Pan American announced token cargo service between the U. S. and the Mid-East—the same area that the two unsuccessful applicants had asked to serve.

The mysterious misplacement of the Defense Department correspondence in Board files, without being seen by several Board members, may have been accidental, but the shoddy manner in which the decision kissed off the national defense value of any new cargo service could not have been accidental.

The Defense Department made clear its attitude on Jan. 12, 1950, when Stephen Early, as Deputy Secretary of Defense, wrote Chairman O'Connell:

"There is considerable military interest in the expansion of the civil air transport industry to the fullest practicable extent, and we believe that the development of new markets of this sort can be effectively instrumental in achieving this end.

"The department feels that whatever practical encouragement can be given to the airfreight industry will be of especial military interest, as long-range, all-purpose aircraft are particularly adaptable to military requirements in the event of an emergency.

"In addition, certification of a service of this sort (the U. S.-trans-Atlantic-Middle East case—ed. note) would provide a subsidiary means to the Department of Defense of effecting delivery of priority cargo. For the above reasons, the department favors the certification of an all-cargo service in this area."

This was the letter that was misplaced.

Fifteen days after the decision was served, May 12, 1952, Defense Secretary Lovett wrote Mr. Nyrop reaffirming the department's interest in expanding commercial air cargo:

". . . The department would like to point out, as in the past, that the purchase and operation by the air transport industry of new long-range transports in cargo configuration is in the interest of national defense. The military establishment deems this particular type of aircraft, together with experienced operating and maintenance personnel, to be an important contribution to the civil reserve air fleet for use in event of emergency. A well-developed trans-oceanic air cargo industry would be of material assistance in meeting wartime military airlift requirements."

It should be emphasized here that Mr. Lovett specified aircraft "in cargo configuration." The passenger airlines of the country have virtually no modern all-cargo planes. Their hundreds of passenger transports could not be adapted immediately to emergency military cargo. Yet CAB has consistently repressed the formation of a new all-cargo system in U. S. flag international operations, just as it held off for so long in certificating new domestic freight carriers.

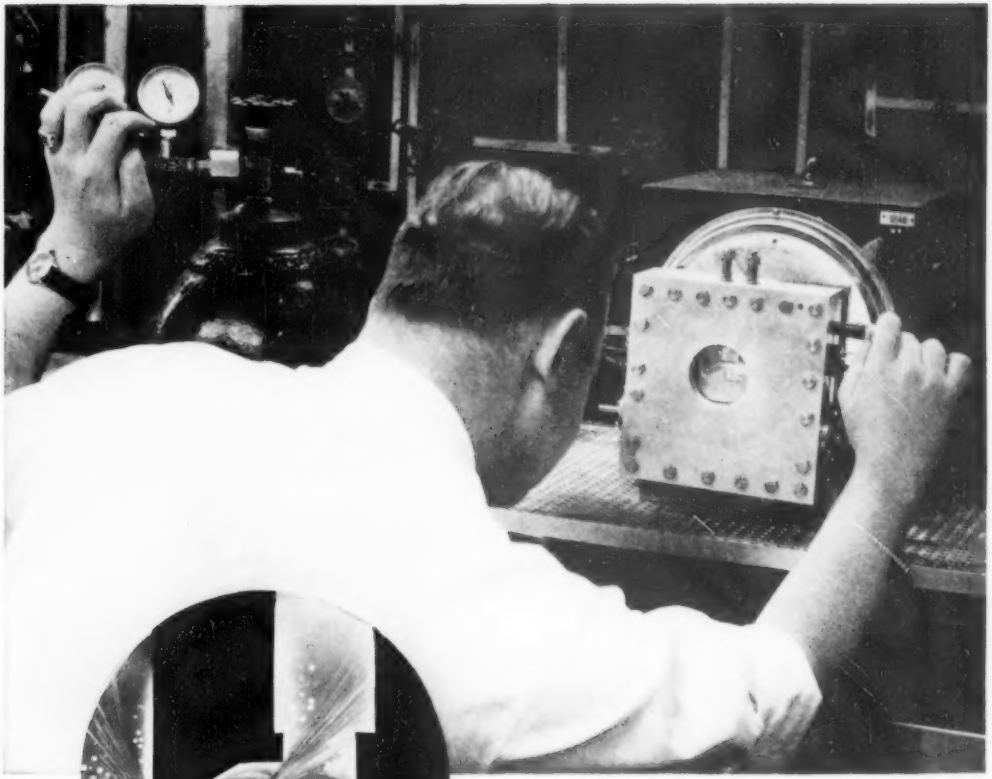
Amplifying the Defense Department's position, the Air Force's Directorate of Plans has consistently reaffirmed the attitude expressed in Mr. Early's letter.

It was developed later, after CAB transmitted its tardy decision to the White House, that the President consulted the Defense Department. The Air Force is said to have disagreed strongly with the Board's rejection of certificates.

The record of the trans-Atlantic freight case offers a list of Air Force testimonials to the applicants' emergency cargo and personnel transport aid over the world, if Board members care to read it!

The fogginess of the Board's vision in comprehending future possibilities of commercial airfreight has been exceeded only by its total blindness to the country's national defense needs. It is to be hoped that the Board members in their current rebellion will see the light and meet their obligations.

—Robert H. Wood.



Fundamental Research for Tomorrow's Aircraft

This Sperry engineer is applying the fundamentals of hydraulics to determine oil flow characteristics at high pressure. Here he introduces nitrogen to the hydraulic fluid in a complex valve to make flow patterns visible for study.

This is an example of the fundamental engineering which precedes the design of high-power booster servos for use in automatic as well as manual flight.

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For 40 years Sperry has been working continually on flight control problems. Currently, Gyropilot® flight controls are flying jet, propeller-driven, rotary-wing, lighter-than-air and pilotless aircraft.

With this background of leadership and experience and the constant exploration of fundamentals for new concepts of design, Sperry is able to anticipate and solve control problems for tomorrow's aircraft.

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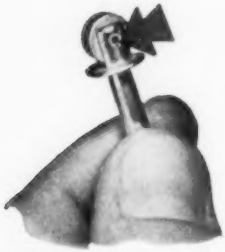
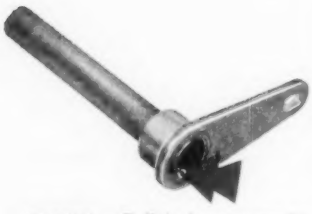


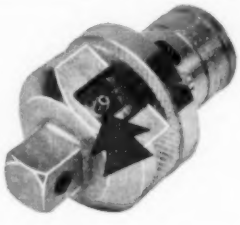
AS A SHAFT . . . Rollpin serves as an axle for the sparkwheel of a cigarette lighter. No riveting or threading necessary . . . faster assembly. Note flush, clean fit.

AS A DOWEL . . . Rollpin is used here to prevent rotation of a thrust bearing. No reaming, no special locking. Easily removed. Lowest possible dowel pin cost.

AS A CLEVIS PIN . . . here Rollpin holds firmly in clevis, permits free action of moving member. Rollpin application above is with the plate of a home workshop tool.



AS A KEY . . . Rollpin demonstrates its ability to do away with precision tolerances, in this heating system damper arm. Faster, cheaper and more satisfactory than usual assemblies.



AS A STOP PIN . . . in this application, Rollpin is shown in a ratchet wrench adaptor. With its light weight and high shear strength, Rollpin functions perfectly . . . cuts assembly costs.

AS A SIMPLE FASTENER . . . Rollpin replaces a set screw in pinning a gear to a shaft. Assembly time is shorter, service life longer. Vibration-proof flush fit. Easily removable.

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